OCTOBER
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Metal Treating

THE *ONLY* MAGAZINE DEVOTED EXCLUSIVELY TO THE HEAT TREATING INDUSTRY

TENTH ANNIVERSARY ISSUE

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About Our Cover

The DeLavaud process for centrifugally casting iron pipe and R-S Furnace Company's association with the method are featured both on this month's cover and in a report by John Beaque, DeLavaud metallurgist for R-S Furnace Company. Photograph courtesy of Griffin Pipe Division, Griffin Wheel Company, Council Bluffs, Iowa. (See page 12.)

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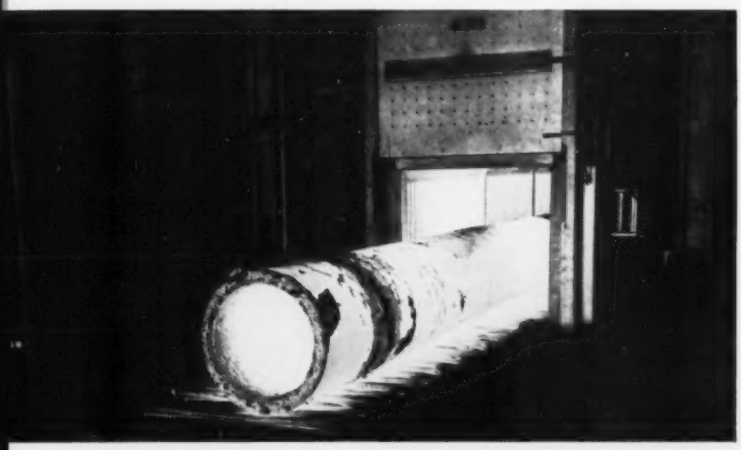
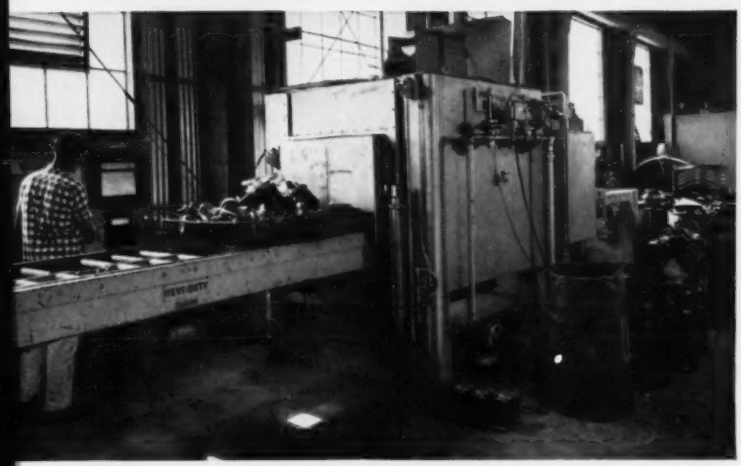


Sandusky Foundry and Machine Company, Sandusky, Ohio, uses this Hevi-Duty car-bottom furnace to heat-treat castings up to 54 inches in diameter and 30 feet in length. Heating elements located in both ends, and in the car bottom, plus three fans, produce a degree of temperature uniformity generally expected only in smaller units. **For complete information, write for Bulletin 644R.**

For further information circle No. 4



Pacific Steel Casting Company, San Francisco, California, is pleased with the operation of this Hevi-Duty Clean-Line Furnace. It heats, holds at the correct temperature for the prescribed period, transfers each load to the cooling chamber, and discharges baskets of castings automatically. A retractor on the unload table enables the Clean-Line Furnace to process four baskets without manual handling or supervision. Heat-treated castings come out ready for shipping without further attention. **For complete information on this, write for Bulletin D-100A.**

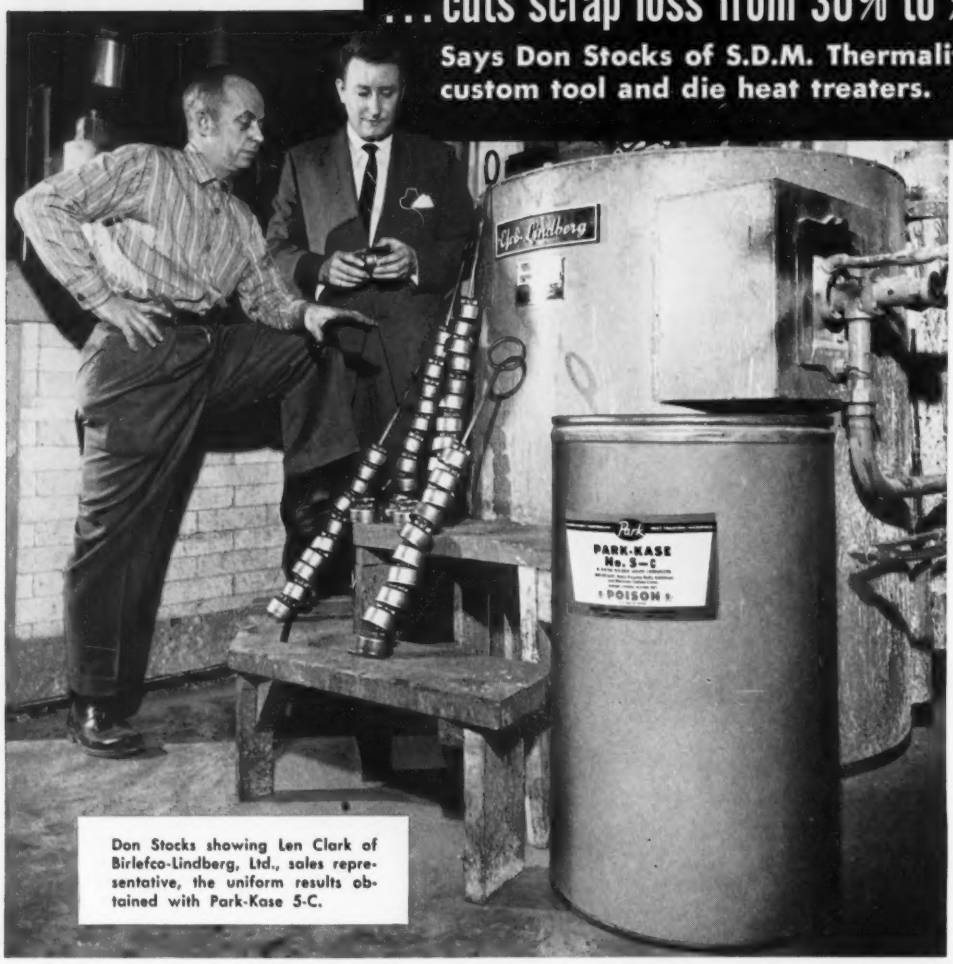
For further information circle No. 3

Eaton Manufacturing Company's Valve Division really proves the ability of Hevi-Duty pit furnaces to maintain uniformity. They process dense 2,000-lb charges of valves — 10,000 to a load — all free from distortion, all uniformly hard . . . no rejects. An efficient fan and baffle system provides an even rate of heating throughout the dense load and contributes to over-all uniformity. **For complete information, send for Bulletin 646A.**

For further information circle No. 5

"PARK-KASE No. 5-C ... cuts scrap loss from 30% to ½ of 1%"

Says Don Stocks of S.D.M. Thermalite Limited, custom tool and die heat treaters.



Don Stocks showing Len Clark of Birlefco-Lindberg, Ltd., sales representative, the uniform results obtained with Park-Kase 5-C.

"Before we used Park-Kase 5-C, the scrap rate on these chain saw sprocket housings ran as high as 30%. To solve this problem, the original manufacturer of the housings contracted the heat treating to us. The experimental results were so satisfactory that we now heat treat all of these housings.

"Since using Park-Kase 5-C, the scrap has been reduced to ½ of 1%. The work comes out cleaner than before with a uniform high hardness. This proves to us that Park-Kase 5-C produces quality work efficiently and economically."

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PARK heat treating salts are now manufactured in Canada by BIRLEFCO-LINDBERG, Ltd., 15 Pelham Avenue, Toronto 9, Ontario. Telephone ROger 6-6456 or write them for information or service on all Park heat treating materials.

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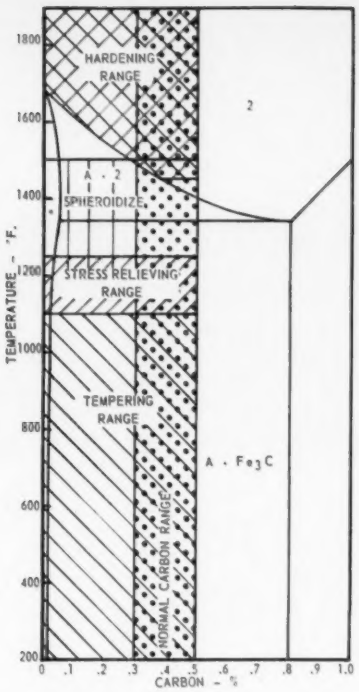


FIG. 1. Iron carbon indicating the various processing ranges.

HEAT TREATING Rocket and Missile Cases

JOHN M. LYNCH

Fabrication Research and Development
Solid Rocket Plant, Aerojet-General Corporation
Sacramento, California

ALTHOUGH HEAT TREATING is currently an important process in the fabrication of steel chambers for solid rocket propellant motors, it has only recently started to receive significant consideration. Formerly, the steel chambers were sent to the heat treat shop with simple instructions for weld stress relief, hardening, and tempering. Fixtures were of the supporting type. Heat treat distortion was not a major factor because the wall thicknesses were fairly heavy.

All this is understandable since the main purposes of those early prototypes of the present vehicles were for the development and testing of various design features including materials and fabrication processes.

The other areas of guidance and ground support were being developed at the same time. Earlier rocket applications were for JATO's and boosters in which high-strength, lightweight inert parts are not an important characteristic. High performance ballistic missiles, however, require lowest possible inert weight. With this in mind, it is apparent why the area of heat treating was not emphasized.

Heat Treating Ultra High Strength Rocket Motors

There are four different heat treatments generally used in the processing of ultra high strength steel for solid rocket motor chambers. (See fig. 1.)

1. Spheroidize annealing.
2. Stress relieving.
3. Hardening.
4. Tempering.

These processes are discussed in the following paragraphs.

The first in order of normal processing is spheroidize annealing. There are several ways to accomplish this but the one method most frequently used consists of heating the steel to or above the critical temperature; holding for a time to allow the temperature to equalize throughout the piece, then slow cooling to a temperature just below the lower critical temperature. Hold times and subsequent furnace and air cooling are developed through the TTT curve for the steel used; (fig. 1 and 2.) This treatment causes the carbides to ball up or globularize and is an optimum condition for press drawing, shear spinning and machining. The desirable amount of spheroidization may vary from 75 to 95%, depending upon the steel composition and the severity of the anticipated forming operations Prior to spheroidizing forgings, it is advisable to homogenize or heat to a temperature of 1800 F. to 2000 F. and hold for 8 to 10 hours. The hardnesses resulting from spheroidize annealing should be approximately Rockwell "B" 85-95.

The heat treater is called on again after the sub-

FIG. 2. Isothermal transformation diagram for Airsteel X200.

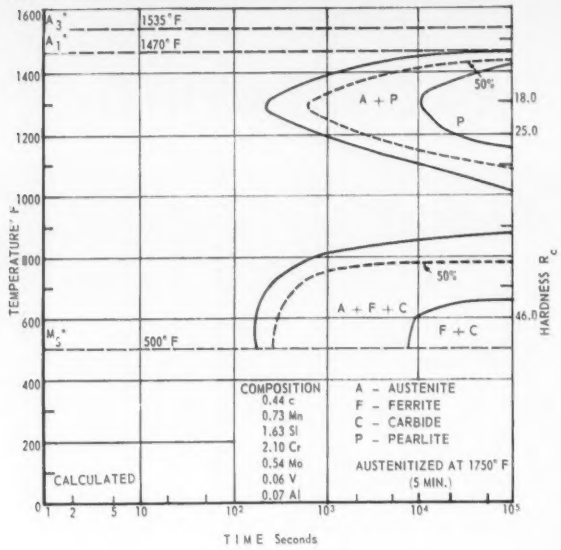


FIG. 3. D6A decarburization study.

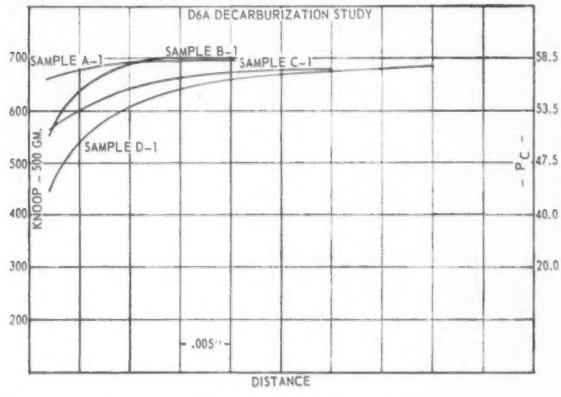
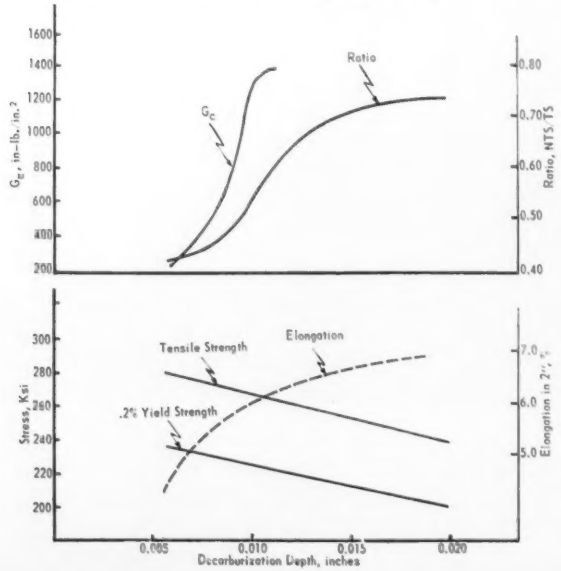


FIG. 4. Effect of decarburization on properties of X-200.



assemblies and completed assemblies are formed, machined and joined. This type of heat treatment is known as stress relieving. Stress relieving is the process where the steel is heated to a temperature under the lower critical degrees and held for sufficient time to equalize the temperature throughout the metal. The purpose of this treatment is to reduce the residual mechanical and thermal stresses to a practical minimum. The temperature may be varied between 1100 F. to 1250 F., depending on the ability of the steel to resist oxidation and decarburization. In cases where 100% stress relieving is desired, temperatures above 1500 F. may be used. Some sub-assemblies that have received considerable cold work may be normalized before stress relieving.

Hardening is the most important and most critical of the services rendered by the heat treater. This treatment consists of austenitizing the steel — heating to a temperature above the critical range so that it approximates a uniform solid solution, and then quenching to a strong martensitic structure. Hardening is important because it imparts ultra high strength to the solid rocket motor case. It is here that great damage could be caused by improper or poorly controlled heat and atmospheres. Injurious thermal shock can result from excessive rate of heating to the austenitizing temperature or from improper quenching. Normalizing is included in hardening because the steels used for solid propellant motor chambers are, for the most part, air hardenable in most thicknesses used.

This is the process whereby the part is heated to a temperature 50 F. to 100 F. above the hardening temperature and air cooled for the purpose of grain refinement. It is not universally used for two reasons: (1) the steels used have appreciable hardenability even with ordinary air cooling treatments and quite often induce distortion; (2) usually little benefit is gained with regard to the mechanical properties in thin wall structures. Occasionally, where grain refinement is necessary in heavy welded structures the in-process parts are normalized. This is followed by a stress relief to restore ductility because of the materials' air hardenability. There is still some question as to the advisability of an individual normalizing treatment even with in-process components.

Tempering is the final thermal treatment in the fabrication of a solid rocket motor chamber. After quenching to a martensitic structure, the accompanying stresses are relieved and the structure is modified for optimum ductility at high strength. The material is stabilized by spheroidal carbon diffusion and coalescence. In this process the part is heated to a temperature below the lower critical, depending on the strength requirements and for a time commensurate to the maximum ductility attainable for the particular alloy at the specified strength level.

Quenching Rocket and Missile Chambers

There are four main methods of quenching solid rocket propellant chambers: air, inert atmosphere, oil and molten salt. Some of the motor cases were made with ultra high strength steels that are air hardenable, such as U.S.S. X-200, Vascojet 1000 (H-11), Thermold "J", Peerless 56, and Ladish D6A. Air quenching is contingent upon configuration and material thickness.

Oil quenching is used by some fabricators for steels such as AMS 6434, 4130 and similar alloys. The oil temperature is usually maintained around 150 F. to 180 F.

Marquenching, which is accomplished in a neutral bath of nitrate and nitrite salts, is the most popular of the four types of media used. In fact, many of the air hardenable steels are hardened by marquenching. Normally, the temperature of the molten salt bath is regulated between 375 F. to 400 F. The purpose of this type of quench is to cut down the thermal gradient between thick and thin sections and to arrest some of the austenite. This helps insure that transformation to martensite is not completed until after removal from the bath. Two phenomena take place in this operation: (1) the steel contracts due to cooling; (2) it expands due to the transformation of austenite to martensite. The thick and thin sections, especially in areas of close proximity as found in rocket configurations, in many cases necessitate the use of marquench facilities.

Inert atmosphere quenching for air hardening steels may be used where the hardenability of certain heats of material in especially heavy sections is questionable, and where certain configurations demand the least drastic of quenches. Usually nitrogen is used because of the relatively low cost. The quenching facility should be water jacketed so that controlled cooling can be accomplished. The facility is particularly advantageous if incorporated with the heating unit. This allows maximum atmosphere control to be obtained by purging prior to insertion of the part to furnace temperatures.

Hardening Atmosphere Control

The controlled furnace atmosphere used in hardening heat treatments is usually effected with an endothermic gas. It is in equilibrium or slightly decarburizing to the carbon content of the steel being treated. The atmosphere carbon potential is usually controlled through dew point analysis of the generator gas and of the furnace gas.

Another method of atmosphere control that is becoming popular is a flame temperature carbon potential controller. This instrument needs individual calibration to the particular installation. It is also extremely accurate and requires little maintenance. One of the advantages of this system is that control is not affected

FIG. 5. Fixture used for tempering a rocket closure.

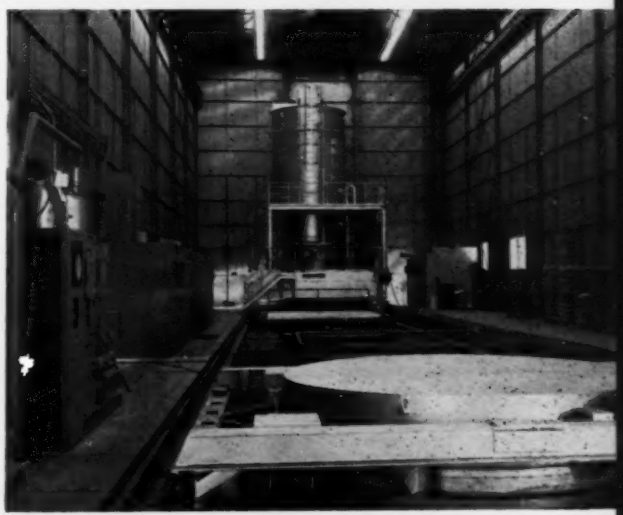


FIG. 6. One of the major Gantry furnaces in use on the west coast is the AGC Sacramento Gantry pictured here.

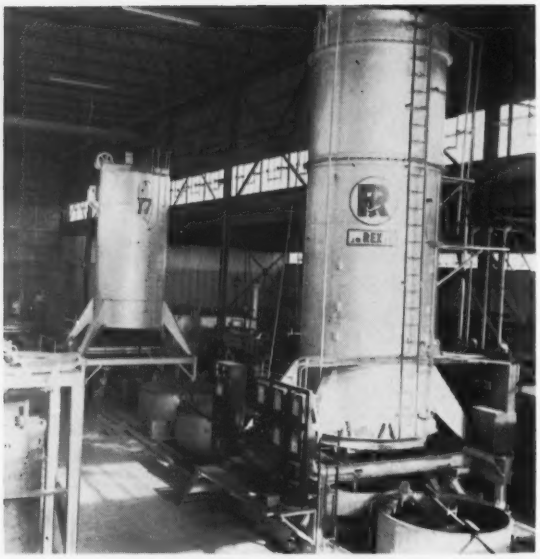
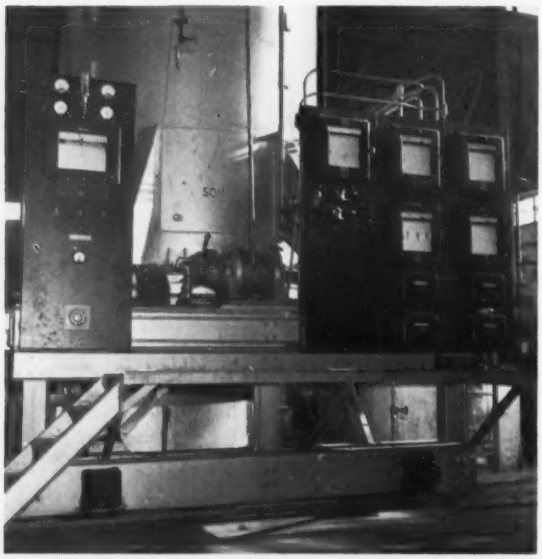


FIG. 7. The J. W. Rex Gantry furnaces at the heat treating facility in Lansdale, Penn. The large furnace in the foreground has been used to heat treat many of the large solid propellant rocket cases. A close-up view of the large Gantry furnace. On the right is the temperature control panel and on the left is the Rolock atmosphere control panel.



by ambient temperatures. The sample of the furnace or gas generator is delivered to a small burner under constant pressure and constant volume. Mixed with air the gas burns over a thermocouple, sealed chromel-alumel T.C., which is located inside the flame. The device measures the temperature of the flame at a single point. To each carbon potential of the sample gas there is a corresponding temperature of the flame.

Shim stock has been widely used to determine furnace carbon potential. The thin gage, usually .005 in.-.010 in., is of low carbon steel, such as, AISI 1010. Since it is sufficiently low in carbon and of a thin gage, it will easily come to equilibrium with the atmosphere present in the furnace, representing the furnace carbon potential. This process is useful as a double check on the controlling and recording instruments. It is especially useful in the electrically heated, non-circulating type of furnaces for adjusting atmosphere flow, inlets, and baffles. The shim stock is strategically placed at various places inside and outside the chamber where particular configurations affect the atmosphere circulation.

Controlled Decarburization

For some time, extensive research and development work has been done to determine the effects of furnace atmospheres on rocket and missile material. Surface carburization is detrimental because the resulting embrittled surface magnifies the stress concentration effect of surface discontinuities. Excessive carburization has been contributory to premature pressure vessel failures. On the other hand, partial decarburization appears to be helpful for two reasons: (1) the effect of surface notches is lowered (fig. 4;) (2) if properly decarburized normal surface tension is lowered, resulting in greater bend ductility. Following are some tensile results of controlled decarburization of Ladish D6A steel .076 in. thick.

Sample	Depth of Decarb (per side) (Fig. 3)	Yield (ksi)	Ultimate (ksi)	Temp. F.
A-1	Negligible	218	228	1100
A-2	Negligible	206	220	1100
B-1	.007 in.	224	234	900
B-2	.007 in.	226	234	900
B-3	.007 in.	225	239	900
C-1	.016 in.	195	202	1100
C-2	.016 in.	204	209	1100
D-1	.023 in.	198	205	1100
D-2	.023 in.	191	201	1100

The above results indicate that a partial decarburization of .032 in., .016 in. per side, decreased the average yield strength about 12 ksi. However, the yield was still high, being at the 200 ksi level. A partial decarburization of .046 in., .023 in. per side, did not appreciably decrease the yield over the .032 in. results.

A rocket chamber fabricated of U.S.S. X-200 was hardened in a decarburizing atmosphere with three

different heats of material comprising the assembly. One of the requirements for this particular heat treatment was a .010 in. to .012 in. partial decarburization. The process was concluded with the following results.

Sample	Avg. % C Before	Avg. % C After	Decarb Before (per side)	Decarb After (per side)	Yield (ksi)
1	.47	.392	Negligible	.010"	228
2	.44	.310	.004"	.013"	199
3	.41	.368	Negligible	.010"	219

The atmosphere used in this process was controlled endothermic gas. The time at temperature is very important in controlling the depth of the reaction. Unrefined exothermic gases were not used because they are more difficult to control than endothermic atmospheres. Poorly controlled exothermic gases have resulted in total decarburization to depths that have lowered the strength of the material.

The dimensional tolerance requirements of solid rocket propellant chambers are extremely close and in some instances approach the tolerances required of aircraft engine parts. In controlling distortion of rocket chamber configurations, careful consideration must be given to the inherent characteristics of the various materials and to basic metallurgical principles. In all heat treatments dimensional control is maintained by preheating, controlled cooling and fixturing. Preheating—or slow heating—and sufficient holding times at low temperatures permit adjacent areas of varying thicknesses to equalize, thermally resulting in a minimum of internal stress.

Fixturing of the restraining type is used primarily in stress relieving and tempering. These fixtures are adjustable, as is shown in fig 5. In stress relieving the fixtures hold dimensions and in tempering, attempts are made to correct deformations caused by hardening. In hardening, the main function of fixturing is support. This is usually a hanging type of arrangement. Most of the hardening fixtures employ the 35% nickel, 15% chrome type alloy.

Basic Requirements for Heat Treating Solid Propellant Rocket Motor Chambers

The following are factors that are being developed to improve solid propellant hardware through the heat treating process:

(1) The effective use of material control. Material should be categorized according to heat treat response and assemblies should be fabricated of matched heats of steel.

(2) The use of in-process dimensional inspection. Maximum use of heat treating is accomplished when the heat treater knows danger areas. He can also intelligently make adjustments to correct deformations.

(3) The assembly must be dimensionally correct and reasonably stress free prior to hardening.

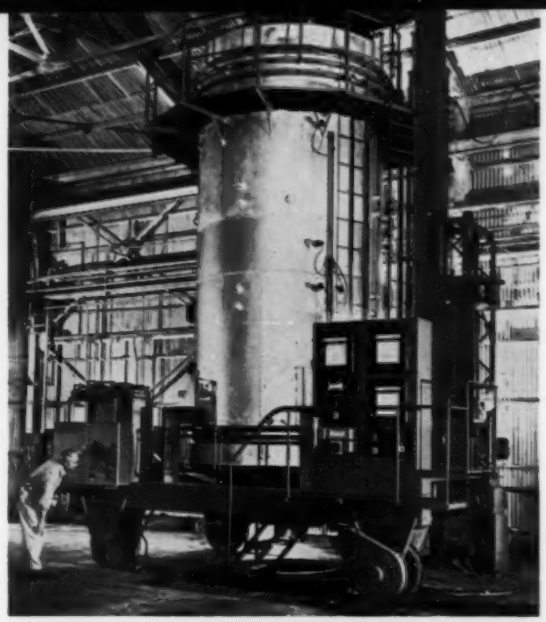


FIG 8. A large Gantry furnace at California-Doran Heat Treating, Inc., Los Angeles. The unit is the only commercial installation with both oil and molten salt quench facilities.

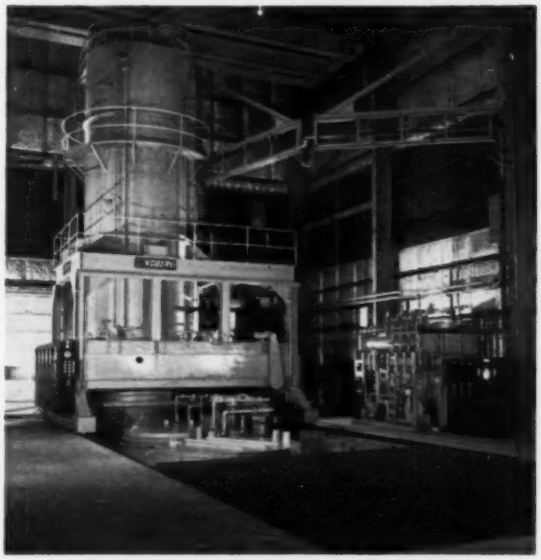


FIG. 9. The Lindberg Gantry furnace in Melrose Park, Ill., affords a "turtle neck" connection between the furnace and a pit installation which can be used for inert atmosphere purging at the beginning of a cycle and atmosphere quench.

(4) Preheating at 500 F. to 1000 F. and especially slightly below or at the critical temperature. This allows the heavy sections to "catch up" to the light sections.

(5) Correct deformation by restraining fixtures in the tempering operation. Minor deformities may be corrected cold but more reliable results are obtained from step tempering. The latter procedure employs heat in correcting dimensional inadequacies. The fixtures are inserted when the chamber is at room temperature,

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after the quench. The part is then heated in the furnace to a temperature below the final tempering and the fixture is adjusted while the part is hot to correct the deformation.

Accomplishments and Outlook

As recently as two years ago many fabricators of missile and rocket cases believed the requirements of the designers to be unrealistic. The fabricators realized that there would be no final machining performed on the cylinder section after heat treating. In other words, the cylinder section would have to be subjected to stress relieving, hardening and tempering temperatures and still met close roundness and concentricity requirements. Heat treaters have met this challenge and in many cases, they have been able to correct fabricating errors to within drawing tolerances. They have consistently been able to control out of roundness in over 50 in. to within .060 in. Atmosphere control tolerances such as no carbon pick up and .0015 in. decarburization per heat treatment or a total of .004 in. due to heat treating have been met.

The majority of solid rocket propellant motor cases are heat treated by commercial heat treaters. Most of the work is accomplished in a mobile furnace called a gantry. Some of these furnaces are heated by gas fired radiant tubes. Others are electrically heated. A gantry furnace is extremely versatile and because of its mobility it can be used with several pit installations of various types. The gantry furnace, which is one of the prime reasons for improvement in rocket chamber heat treating, is the result of the commercial heat treaters' ingenuity. Figures 6, 7, 8 and 9 show some of the leading makes of gantry furnaces available.

What is the future of heat treating in solid rocket propellant cases?

1 There seems to be a definite place for the brazing of certain joints. Development programs are in progress to determine the feasibility of brazing.

2 It is now apparent that each heat treating process must be adequately instrumented so that time, temperature, and atmospheres are completely controllable. It is only through absolute control that reliable decarburization cycles can be employed.

3 Future rockets will undoubtedly be quite large. Large rockets will probably be put together in segments. If this is the case, segmented furnaces with segments 20 ft. to 30 ft. in diameter and 10 ft. to 15 ft. high might be the answer. The commercial heat treater must continue strong efforts to meet the needs of industry because there are many processes under development which would eliminate or minimize heat treatment for solid rocket chambers. Included in this area are the process of wrapping and bonding helical strip, filament winding, and sonic heat treating. Consideration is also given to the use of un-heat treated steels in large thicknesses in addition to the use of non-ferrous alloys requiring little or no heat treating. • • •

WHAT WOULD YOU DO?

a problem in labor arbitration taken from the files of the American Arbitration Association

CASE OF THE ELIMINATED EXPEDITER

For a number of years, it had been the practice in a medium-sized manufacturing company for supervisors to receive telephone inquiries from customers about work in progress and pass them on to an "order expediter," a member of the bargaining unit, who would locate the work on the floor and report back. The supervisor would then call the customer and give him an estimated time of delivery.

In February, 1960, however, a new mechanical system of record keeping was installed, making it possible for the supervisors to give customers all the information they wanted on the spot. Occasionally, perhaps once a day, it would be necesssary for someone to check progress of the work personally. In that case, the supervisor would do it himself. Under the new system, the company decided to eliminate the job of "order expediter."

This led to a grievance. "You can't take work away from a bargaining unit employee and give it to a supervisor," argued the shop steward. "As long as there is expediting work to be done it belongs to the order expediter."

"The order expediter's job has been eliminated by introduction of new machines," answered the industrial relations director of the company. "No one is doing the old style expediting except once in a while in an emergency."

Ultimately, the dispute went to arbitration under the rules of the American Arbitration Association.

THE AWARD. The arbitrator said the company had the right to eliminate jobs or set up new ones, within or outside the bargaining unit, as long as new jobs outside the unit didn't include duties which the contract assigned to bargaining unit employees. It was perfectly all right, he concluded, for supervisors to answer telephone inquiries from their records and to dispense with the order expediter to that extent. However, he added, calling something an emergency didn't necessarily make it so. When a supervisor had to make a personal inspection of work, he was doing what the order expediter used to do. Even if it happened only once a day, it was work that belonged to a bargaining unit employee. The arbitrator added that it would be unreasonable for an expediter to wait around all day just for that one assignment. Management could rearrange the work for more efficiency provided the expediting detail was kept in the unit.

CAUTION. The award in this case is not necessarily an indication of how other arbitrators might rule in apparently similar cases. Arbitrators do not follow precedents. Each case is decided on the basis of the particular history, testimony and other facts involved.

CONTINUOUS ANNEALING of CENTRIFUGALLY CAST IRON PIPE

JOHN BEAQUE

DeLavaud Metallurgist
R-S Furnace Company

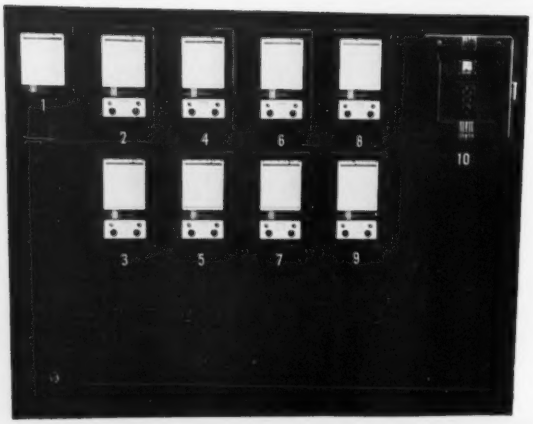


FIG. 1. Master control panel illustrating the (1) charge zone; (2) intermediate zone, bell side; (3) intermediate zone, spigot side; (4) soak zone, bell side, front; (5) soak zone, spigot side, front; (6) soak zone, bell side, rear; (7) soak zone, spigot side, rear; (8) cooling zone, bell side; (9) cooling zone, spigot side; (10) pressure regulator.

THE DE LAVAUD PROCESS for centrifugally casting iron pipe was first introduced into this country in the early 1920's. The R-S Furnace Company has been closely associated with the process since that time.

In this process, pipe, principally of the bell and spigot, push-on or the mechanical joint type, is cast centrifugally in horizontal, rotating, water cooled metal molds. After the pipe is formed, the mold continues to rotate until the metal has solidified. It is then withdrawn from the casting machine and transferred to a continuous, annealing furnace, where it is heated to approximately 1760 F., then slowly and uniformly cooled to approximately 1100 F. before emerging from the furnace.

From the inception of this process, it was recognized that the annealing furnace equipment should be of the continuous rather than batch type. This was necessary in order to maintain an orderly production flow from the casting machines, maintain a maximum amount of residual heat in the work, and to heat with a higher degree of uniformity than is possible in a mass load. This point seems quite obvious today; however, at that time continuous mechanisms operating at over 1700 F. were almost non-existent. Heat resisting alloys were available, but at a price considered to be exorbitant. Moreover, their service life was unpredictable and maintenance costs were high.

The first R-S continuous annealing furnace for cast iron pipe was installed in 1922. The 12 ft. lengths passed through the furnace broadside. The conveying mechanism consisted of two rows of rotating disks, each disk having a circular recess at one point on its periphery. The long axis of the pipe was at right angles to the disks and supported by them. As the disks rotated, the pipe moved forward in the furnace, turning as it moved and automatically transferring from one set of disks to the next. To simplify maintenance, the refractory furnace bottom and the rotating disks were mounted on a wheeled car which could be pulled out of the furnace for access to the working parts of the mechanism.

A portion of the furnace toward the discharge end was unheated and was built with a number of vents in the roof to assist in dissipating heat during the cooling cycle.

The heating chamber was heated with side wall burners firing behind refractory baffles to prevent flame impingement on pipe and conveying mechanism. Flue openings in the side walls at hearth level gave the hot gases direction and pulled them over and around the pipe for better uniformity. No automatic temperature control equipment was used, or thought necessary, and burners were adjusted manually at the discretion of the furnace operator.

These early furnaces worked reasonably well but their faults became all too apparent as the economics of the De Lavaud process opened up a rapidly enlarging demand for greater tonnage and higher quality pipe.

By 1927 it was recognized that a conveying method was needed which would handle the pipe gently in order to eliminate the mechanical shock to the pipe when it was transferring from one set of disks to the next.

This was especially troublesome as the disk edges wore down in service, and the pipe had a bumpy ride through the annealing furnace.

The conveyor design which emerged at this time was one which with some refinements is still in use today. It consisted of two heavy chains operating in longitudinal troughs in the fixed refractory hearth of the furnace. The troughs narrowed to a slot at the top through which removable fingers protruded. The fingers, rigidly attached to the chains, moved continuously through the furnace, rolling and rotating the pipe. The pipe in turn rolled on skid rails, elevated somewhat above the hearth, permitting the hot furnace gases to sweep under the pipe.

Improvements in automatic controls for furnace burners, the development of light-weight refractories, dependable heat resisting alloys, and improved methods of cooling the pipe, came into use as the furnace design kept pace with developments in the heat treating industry.

The newest installation of this type of equipment has recently been placed in service in the Griffin Pipe Division plant of Griffin Wheel Company at Council Bluffs, Iowa.

This furnace is nominally rated at 30 tons per hour in sizes up to 20 ft. long and 12 in. diameter, but can handle larger diameters and a greater tonnage as required. The head and tail shafts of the pipe conveying system are 105 ft. 7 in. on centers and a 5 HP motor variable speed drive moves the product through the furnace on six rows of sectionalized silicon-carbide skids. The sectionalized silicon carbide skid rails 2½ in. thick by 18 in. long are arranged in a herringbone pattern to help maintain pipe alignment as they progress through the furnace. The furnace hearth is sloped uphill toward the discharge end insuring that the pipe is kept in constant contact with the propelling fingers. Extreme care is taken when building this portion of the furnace, and the hearth gradient is constantly checked with instruments to insure a smooth surface for the pipe to roll on.

Luminous flame gas burners with an installed capacity of 30 million BTU per hour fire through the furnace side walls above the work, and are arranged in four separate groups. The first group of burners are at the charging end of the furnace and are controlled as a single zone from a two-position type strip chart recording controller. The two-position type instrument is used in this zone because the burners are nominally firing at full demand.

The second group of burners comprise the balance of the heating section and are controlled in two zones from two proportioning type strip chart recording

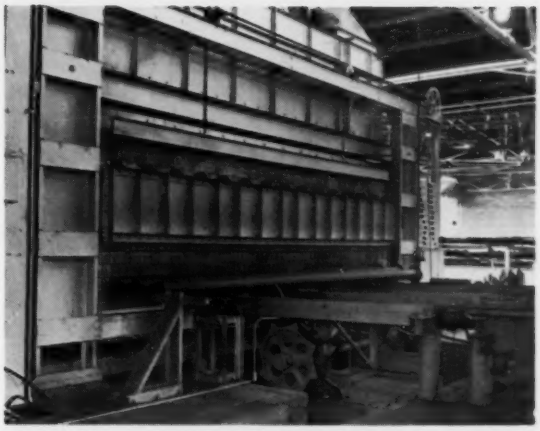


FIG. 2. Six in. diameter mechanical joint pipe 20 ft. 5 in. long, overall, being fed into the furnace. The sprocket type conveyor keeps pipe revolving during the entire annealing cycle.

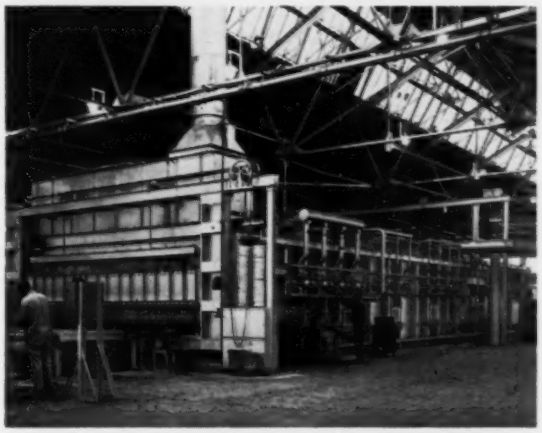
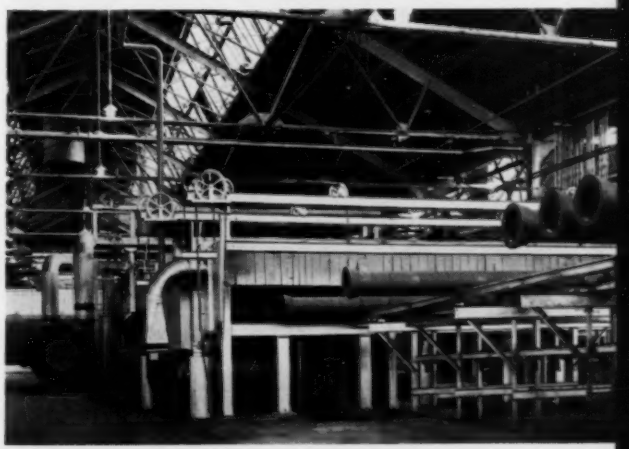


FIG. 3. Pipe shown rolling onto chain conveyor and into annealing furnace. Overall dimensions 30 ft. by 105 ft. The pipe is heated to 1760 F., held at that temperature until annealed.

FIG. 4. Approximately one hour later the pipe leaves the furnace properly annealed to insure a tough cast iron pipe that can be easily cut, drilled and tapped in the field. The conveying system forces pipe to rotate during cooling to prevent metal from becoming out-of-round.



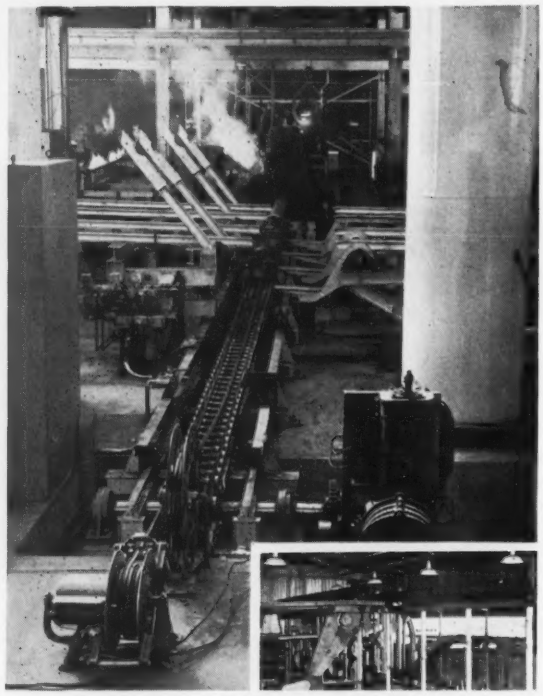


FIG. 5. Extraction of pipe continues. In the background, transfer ladel refills quadrant ladle for casting next pipe.

FIG. 6. Each length of pipe is subjected to a positive reading Brinnel hardness tester specially designed for the Griffin operation. A metal ball, 10 MM in diameter, is impressed into the metal surface under a 1,500 kilogram load, measuring both load and depth of penetration.

controllers. These two zones of control are across the furnace width instead of along the length, and are arranged in such a way that the burners along one side wall are controlled from a thermocouple on the opposite side of the chamber. This control method was developed in order to satisfactorily balance out temperatures in very wide heating chambers.

The third and fourth group of burners comprise the holding or soaking sections, with the automatic temperature controls arranged in similar fashion to the second group described above.

In addition to the main heating burners, auxiliary burners are provided in the side wall of the furnace, adjacent to the bell ends of the pipe. This furnishes a greater heat concentration for the heavier metal sections in the bells of the pipe. These burners are manually controlled by the furnace operator to suit the size being processed.

Cooling of the pipe, following the soaking section, is effected by means of alloy cooling tubes mounted under the furnace roof. These are automatically controlled in two groups, each group being controlled as a single zone from a proportioning type strip chart recording controller. Cooling air is supplied to the tubes by means of a separate motor driven blower with capacity to cool the pipe rapidly and uniformly from annealing temperature to a point just above the lower critical temperature. From this point on, the pipe cools at a slow, natural rate through the lower critical temperature before finally being discharged from the furnace into air.

Direct air cooling of the pipe is undesirable because of its tendency to raise scale. For this reason the indirect method of cooling with air cooled tubes is used.

The pressure in the furnace is also automatically controlled in order to promote temperature uniformity in the pipe. This is accomplished by means of a motor operated damper in the main furnace flue, which is positioned by an automatic controller to maintain a nominal pressure of 0.065 in. W.C. in the furnace.

In order to prevent drafts which could adversely affect temperature uniformity the discharge end of the furnace is equipped with an air lock chamber similar in principle to those used in the entrance doors of air conditioned buildings. This feature has worked well, particularly on units located where the furnace doors are adjacent to exterior openings.

The furnace normally operates on natural gas but is equipped with a standby utilizing premixed propane gas during those operating periods when the natural gas supply is restricted.

Waste gases are vented from the furnace through an overhead flue at the charging end of the furnace. This in turn connects to a vertical steel stack which carries the gases out through the building roof and discharges them to atmosphere.

The R-S Furnace Company also engineered and

FIG. 7. Huge pre-mixed propane gas storage serves as standby for the annealing oven to avoid shutdown in the event gas service is interrupted. This 30,000 gallon storage tank under 150 psi pressure is equivalent to approximately 2½ days' production.

installed the Griffin Pipe Division annealing furnace. Quality control checks such as Brinell hardness testing apparatus indicate a thorough anneal and easy control of hardness. ASA 21.6 specification for cast iron pipe calls for a maximum hardness of Rockwell B95 — equivalent to Brinell hardness of 207. Microanalysis shows that a very consistent job of annealing is obtained, that a structure is obtained free from embrittling carbides and with the desirable type A graphite flakes. The flexibility of this furnace and its extra length provide these desirable structures without danger of over annealing or scaling.

This flexibility permits the production of pipe which more than meets minimum physical specifications. For example:

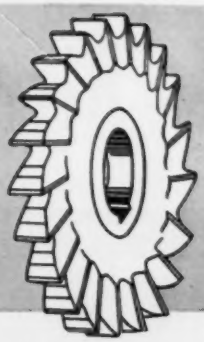
	ASA 21.6 Pipe Specifications	Griffin Averages
Burst tensile	18,000 or 21,000 p.s.i.	25,000 p.s.i. plus
Modulus of Rupture	40,000 or 45,000 p.s.i.	50,000 p.s.i. plus
Secant Modulus of Elasticity	12,000,000 p.s.i. Max.*	8,000,000-10,000,000/**

*ASA 21.6 Cast Iron pressure pipe specifications made in metal molds specify, that if modulus of elasticity exceed 12,000,000 p.s.i., the modulus of rupture shall exceed 40,000 p.s.i. in same proportion.

**Full length flexural tests confirm superior elasticity that can be expected from properly annealed pipe.

● ● ●

Better Tools From SENTRY Hardening



THE TRUE TEST of your machine tools is their performance on the job — how they benefit your production. This is where Sentry Furnaces with the Diamond Block method of atmosphere control demonstrate their value. Your high speed steel tools hardened in the truly neutral Sentry Diamond Block atmosphere achieve maximum hardness without scale or decarburization, maintain their sharp cutting edges longer, step up production.

Write for literature and send sample of your tools for free demonstration hardening.

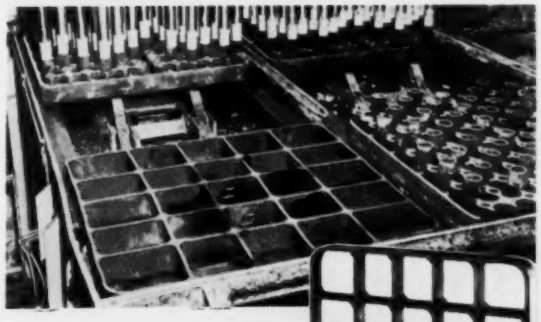
303-B

Sentry ELECTRIC FURNACES

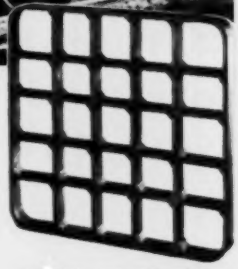
Request Catalog S-15. Write THE SENTRY CO., FOXBORO, MASS.

For further information circle No. 8

Wiretex BASE TRAYS *OUTLAST* CAST TRAYS 3 to 1



Tests at Ford's Indianapolis Steering Gear and Cold Heading plant proved Wiretex fabricated alloy trays saved many dollars, outlast other trays by more than 3 times. 26 months later, the trays were still in use, without replacement.



Another example of how WIRETEX solves special parts holding fixture problems.

Call Wiretex for all your heat treating requirements to resist acid, heat, abrasion or exposure.

Specialists in Processing Carriers Since 1932.

Wiretex mfg. co.,

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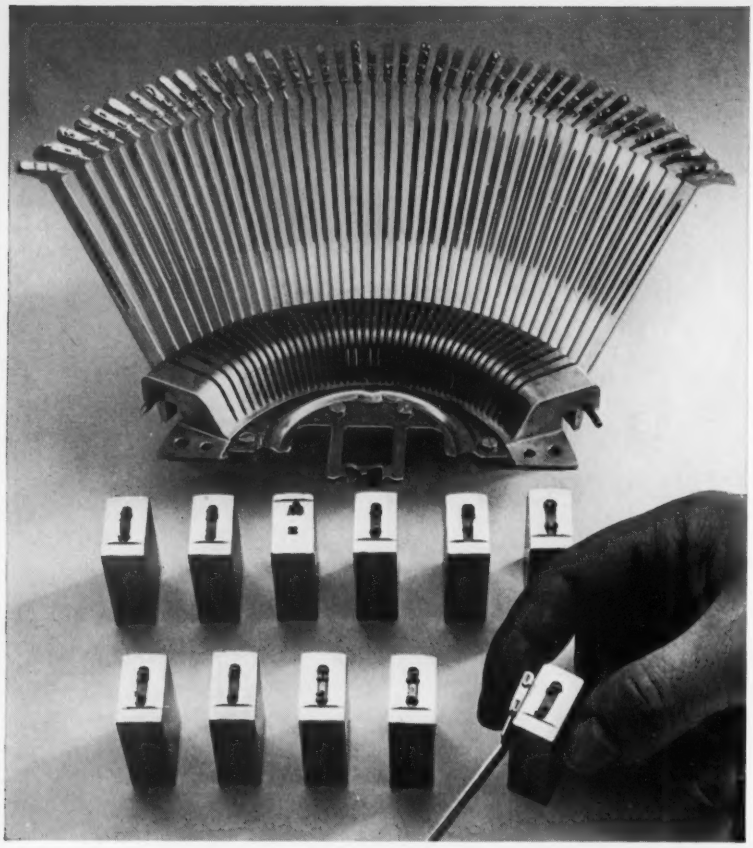
For further information circle No. 9

Tool Steel Topics

BETH·EHEM STEEL



IBM makes 200 per cent more type slugs per matrix with Bearcat Tool Steel

Talk about enthusiasm! At the Lexington, Ky., plant of International Business Machines Corp. they have good reason to sing the praises of Bearcat tool steel. Recently, production of type slugs per matrix was improved 200 per cent by changing to a die made of Bearcat. The die "kneads" raised letters of the alphabet into steel slugs.

Bearcat is best known for its remarkable shock-resistance. In this instance, the manufacturer also reported better resistance to wear, and easier machinability (as compared with the tool steel formerly used).

Bearcat is our super grade of shock-resistant air-hardening tool steel. It's ready and willing to handle the toughest shock applications. Because it's an air-hardening steel, Bearcat minimizes both quenching hazards and distortion in heat-treatment.

Like to try Bearcat? Telephone your Bethlehem tool steel distributor.

BETHLEHEM TOOL STEEL

ENGINEER SAYS:

TOOLS can be repaired by welding if the proper procedure is used

To incorporate design changes or repair, all tools and dies made of tool steel can be welded successfully if the following procedure is observed:

1. Full-anneal the tools. Good atmosphere control is necessary to avoid scaling and decarburization of the working surfaces.

2. Prepare the crack for welding by "veeing" its full depth and length. Magnetic particle inspection is advisable.

3. Use a welding rod which will deposit steel of the same composition as the tool.

4. Preheat to 400 F - 800 F, and maintain this temperature during welding.

5. Clean the slag from each bead before proceeding with the next bead.

6. Immediately after welding, transfer the tool into a warm furnace (400 F min) and full-anneal.

7. Machine or grind the weld to the desired tool dimensions.

8. Heat-treat the tool by quenching and tempering to the desired hardness, using the standard procedure for the grade involved.

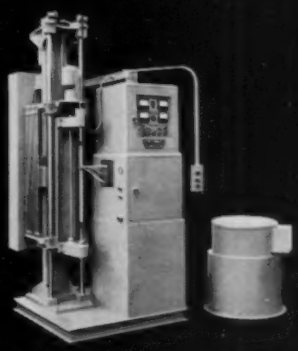
9. Grind the tool working surfaces. The depth of metal removal will depend upon the amount of decarburization produced in Steps 1, 6, and 8.

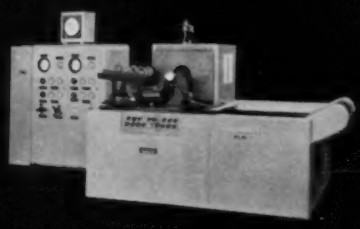
The use of this procedure will permit the successful welding of tools if it is essential that welding be done. In the majority of instances, however, it will be found both cheaper and quicker to make up new tools.

When emergency welding is done on a production line, it is often necessary to eliminate many of the steps mentioned above, thereby reducing the chances of producing successful welds.

Behind these doors heat is trained to serve the world of industry

ADVANCED HEAT ENGINEERING





Cincinnati heat engineers can analyze your particular heating problem, develop the necessary process, adapt a standard machine to the job, or design a special work-processing unit.

CINCINNATI®-

center of thermotic science and research— creates ultra-modern machines for today's heat processing requirements

From ancient days, man has regarded the element of fire with great respect. Today, *Cincinnati Advanced Heat Engineering* has fashioned the heat of flame and electricity into remarkable tools of production.

From the knowledge gained by research and experience in heat engineering, Cincinnati has developed a complete line of ultra-modern heating equipment: Flamatic® flame heating and Inductron® radio frequency and motor-generator induction heating machines. Backed by extensive facilities, Cincinnati is recognized as a leading engineering source for the application of heat as a processing tool.

Cincinnati is ready to serve you with engineering calculations and the selection and tooling of heating equipment to solve many heat processing problems. As builders of both flame and induction heating machines, Cincinnati can give you truly unbiased recommendations for the most efficient and economical heat processing method. Whether your application is simple or complex, let the benefits of *Cincinnati Advanced Heat Engineering* work for you.

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FOCUS ON THE . . .

42nd National Metal Exposition

Industry attention comes into focus this fall as the 42nd National Metal Exposition opens in Philadelphia's Convention Hall, October 17 thru 21. Featured in these paragraphs are some of the exhibitors, businesses of the hour, who will present to visitors the latest developments in the metal treating industry. These are but a few—a preview, in fact of the many that will make the 42nd National Metal Exposition one of the most memorable in history.

C. I. HAYES, INC.

Booth 1454

A console cold wall vacuum furnace which consolidates the multiple components of the unit into a compact, attractive case of modern design will be introduced at the ASM show by C. I. Hayes, Inc., of Cranston, R. I.

This furnace, Model VAC-52, offers many completely new features of special interest to small job shops, laboratories, and similar operations. Designed as a complete package, installation consists of simple connections to water and power. It is so designed that it is virtually portable. Maximum operating furnace temperature of the standard unit is 2200 F. with vacuums in the 10^{-5} mm. Hg. range. Maximum temperature of the furnace can be developed in a matter of a few minutes and cooling can be effected almost as rapidly. The 10 in. diameter by 20 in. deep stainless steel vacuum chamber offers a useful work area of 8 in. diameter by 14 in. deep.

The access door and all control equipment are conveniently located on the front panel with access panels on the sides and back to facilitate servicing. A crank operated work pedestal transfers work from lower section (vacuum cooling chamber) to heating chamber which contains 30KVA heating elements with sufficient power to heat the chamber to 3000 F. when special element and baffling materials are used. Interchangeable heating elements and radiation shields increase operating flexibility of unit in vacuum brazing and heat treating production work.

MIDLAND-ROSS DIVISIONS

Booth 1540

A special strip coating display will be featured at the 42nd Annual Metal Show, in the booth manned by some of the divisions of Midland-Ross Corp.

The display, in booth 1540, will include a 12 ft. model of a complete Ross-Waldron strip coating line, along with pictures, literature and samples of end products using the finishing process.

Twenty representatives of the J. O. Ross Engineering Division and ten representatives of the Waldron-Hartig Division will man the booth.

Both the booth and a hospitality suite will be shared with another Midland-Ross Division, Surface Combustion.

Surface will present their annealing line and will also have a model on display.

VANADIUM CORPORATION

Booth 204

Vanadium Corp. of America has announced the format of its exhibit at the National Metal Exposition. The showing will highlight Vancoram products for stainless steels and alloy steels.

In special display will be shown quality ferroalloys for stainless steels, including those of boron, chroium, columbium, silicon, titanium and vanadium. Complementing these will be an array of end use products of stainless steel. Paralleled will be a similar exhibit of alloy and tool steels and the Vancoram products involved in their manufacture.

A unique decorative feature of the booth will be a ferroalloy rock garden made of ferrochromium and multi-hued ferrotitanium alloys.

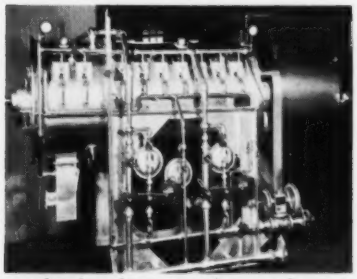
Featured among the new products will be Thermocol and special

ferrochrome-silicon alloys which are designed for use in stainless steel production.

AMERICAN GAS FURNACE CO.

Booth 1910 B

A new Automotion furnace and quenching tank will be exhibited by the American Gas Furnace Company at Booth 1910B at the 42nd National Metal Exposition. An interesting feature of this continuous



production heat treating equipment is that processing uniformity is assured because the parts are kept in motion during heating and quenching. Motion of the parts in the furnace retort assures each part receiving the same heat and exposure to the atmosphere as every other part. Motion of the parts in the rotary quenching drums provides a superior quenching action to obtain maximum uniform hardness.

Automotion, or motion of parts, during processing is of specific advantage in carburizing and case hardening — especially light case work — because it eliminates point of contact case variation caused by continuous contact between the surfaces of stationary or nesting work pieces and between the work pieces and conveying mechanism.

The Automotion furnace installation has a built-in continuous feeder which saves the several thousand dollar cost of a separate feeder and virtually eliminates the labor in feeding parts.

Conveyor and other troublesome conveying devices are eliminated in Automotion furnaces. The furnace and quenching tank utilizes a spiral which is an integral part of the furnace retort and quenching drum to convey the work through the heat and quench.

F. J. STOKES CORP.

Booth 1625

A new cold wall vacuum heat treating furnace, Model 435-585, which incorporates a completely packaged top loading furnace system with temperatures up to 3000 F., will be introduced by F. J. Stokes Corp., Philadelphia, at the 42nd National Metal Exposition October 17-21.

Also on display at the Stokes booth will be the Model 437-521 50 pound capacity vacuum melting and precision casting furnace, a notable example of the type of equipment Stokes has developed for precision casting of high temperature alloys and other materials which must be melted and poured under high vacuum conditions.

The new Model 412-H Microvac Pump, one of the recently announced Series "H" units, will also be demonstrated in the Stokes booth. The new Microvacs feature quiet, vibration free operation and compact design, saving up to 50% in floor space as compared to other vacuum pumps of the same capacity. A few of Stokes' broad line of gages and valves will round out the display.

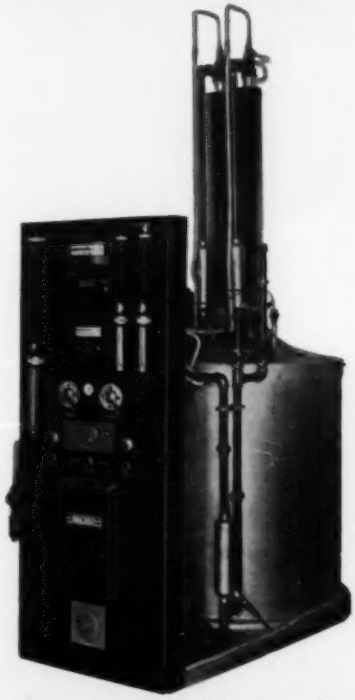
ROLOCK, INC.

Booth 1809

Rolock, Inc., Fairfield, Connecticut, will feature the new Rolock carbon potential controller, Rolock reversible endothermic gas generators, and Rolock ammonia dissociators at their exhibit booth.

Developed to meet an increasing need for practical means to maintain precision control over the carbon potential for the gaseous atmosphere in heat treating furnaces, the Rolock carbon potential controller does not use dewpoint as the control basis, instead it continuously senses the dependably constant temperature-carbon relationship in a small burning sample of the furnace gas. The sensing element, through a recording controller and servos, promptly and accurately corrects the atmosphere.

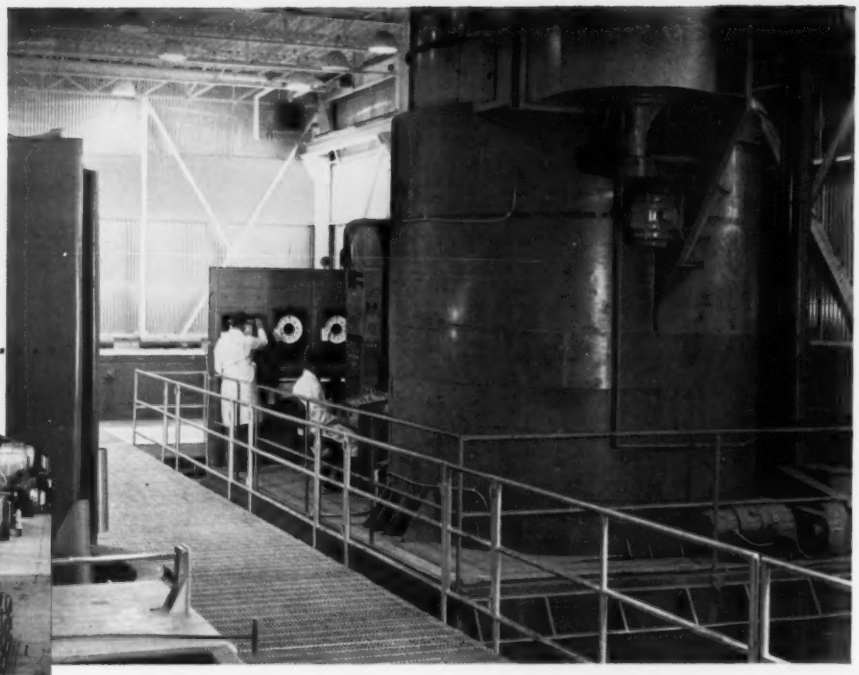
Rolock's newly developed endothermic gas generator, also on exhibit under operating conditions, is

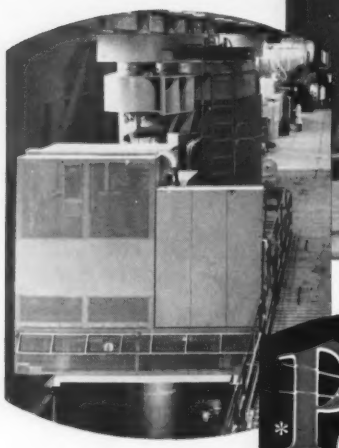


said to have solved the complex problem of providing an efficient, dependable and accurately controllable endothermic furnace atmosphere gas supply, using propane, manufactured or natural gas as the source. Employing a unique, fully reversible dual catalyst chamber system, the catalyst beds can be cleaned quickly by simple reversal and with-

Continued on page 21

At The Marquardt Corporation's Ogden Division . .





this NEW

DUAL RANGE GANTRY FURNACE

heat treats both aluminum and steel alloys

Now in operation at the Marquardt Corporation's Ogden facility, this giant Pacific Gantry Furnace provides dual heat ranges to permit heat-treating aluminum or steel alloys. Conversion from steel to aluminum treating takes a minimum of 4 hours.

Inside working diameter of the furnace is 72″ with a depth of 120″. Operation is automatic—the furnace operator on the gantry platform is seated at a control console as the furnace, mounted on tracks, moves over the quench tanks.

When heat-treating aluminum, temperature uniformity is held to ±5°F. in a temperature range of 250°F. to 1400°F. A temperature range of 1200°F. to 2000°F. is used for the steel alloys with a uniformity of ±15°F. This excellent uniformity is achieved with three zones of control using saturable reactors.

When set up for aluminum alloys the furnace may be used for Marquardt parts where large cylinders and cones can be solution-treated and water-quenched. Steel alloys to be heat-treated include large rings of AISI 4340, 310 Stainless Steel cylinders and various types of Die Steels.

This Pacific Gantry Furnace at Marquardt is one of a number of unusual, special purpose furnaces Pacific Scientific has custom-designed and built for the aircraft and missile industry—that produce savings in materials handling time as well as first-cost and maintenance.

Whatever your needs, a Pacific engineer will be glad to discuss them with you. Write or call today!

Pacific ®TRADE MARK

GAS OR ELECTRIC INDUSTRIAL HEAT TREATING EQUIPMENT

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Creative Development and Manufacturing in Furnace Design

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Name_____

Company_____

Address_____

City_____ Zone____ State_____

For further information circle No. 12

FOCUS . . .

Continued from page 19

out shutdown. The generator is equipped with complete safety devices and automatic malfunction alarm.

Both carbon potential controller and endothermic gas generator will be exhibited in operation. Other features of the rolock exhibit will include the companion Rolock ammonia dissociator, Rolock furnace equipment, retorts and baskets, as well as demonstration samples of the new Rolock pressure welded construction for grids and furnace trays.

CHARLES A. HONES, INC.

Booth 1910-D

Products representative of the complete line of Charles A. Hones, Inc. will be featured at that firm's booth at the 42nd Annual Metal Exposition.

In addition to the regularly marketed items, the company will also have exhibits of a number of special units, including: #55 oven furnace for heat treating, #170-10 high temperature melting furnace, #125 soft metal melting furnace, #183 atmospheric pot furnace, and #1224 high temperature oven furnace. The latter will be connected and in operation during the entire show.

COBALT INFORMATION CENTER

Booth 631

The Cobalt Information Center's exhibit at the exposition emphasizes the importance of cobalt and its alloys in industry today. Samples illustrating the varied uses of cobalt will be displayed. Literature on cobalt in steels, magnets, high-temperature alloys and superalloys, and chemicals, general properties and uses, coatings and corrosion; fabrication, and physical metallurgy will be available. Current copies of the Center's quarterly, *Cobalt*, will be available, and interested persons may arange to receive this regularly.

In keeping with the steel theme of the 1960 show, Dr. F. R. Morral, who directs Cobalt Information Center activities in the Americas, states that "Increased amounts of cobalt are being used in the steel industry. The consumption of cobalt in low alloy and tool steels during the past year was five times greater than in previous years." Among recent developments, he cited the new cobalt containing steels for use in missile casings and forgings, and added that the Center is sponsoring fundamental research in this area to understand better the properties imparted by Cobalt to iron and steel.

TEMPIL CORPORATION

Booth 1327

Aerosol packaging of Tempilaq° temperature indicating coatings will be presented at the show for the first time. Some 40 systematically

spaced temperature ratings, covering the range from 100 F. to 650 F. inclusive, will now be available in a choice of the spray type container or the standard glass bottles equipped with applicator brushes.

The spray can package has been developed to meet the often expressed need for a convenient method of coating large surfaces with Tempilaq°. Such applications are encountered in the fabrication of massive structures, non-destructive testing of honey-combed panels, monitoring the operating temperature of reaction vessels, etc.

Trained personnel will demonstrate how temperatures are determined by means of Tempilstiks°, Tempilaq° and Tempil° Pellets. They will be prepared to discuss special applications in the metals and metalworking fields.

METALLOGRAPHIC EXHIBIT

Leading metallographers from throughout the world will present over 300 examples of their finest work at the American Society of Metals' Metallographic exhibit, a feature of the 1960 National Metal Exposition.

The ASM Metallographic Exhibit is geared to encourage improved metallography. This exacting science helps explain why metals and materials behave as they do under various conditions and combinations. The results of heat treatment will be of particular interest to visitors.

Many metallographs to be exhibited will rival modern art in beauty of design and color. They are actual photographs of the minute structure of materials as revealed by the microscope. Through electron microscopy, metallographs can be made of structures magnified upwards of 25,000 times their original size.

Prize winning metallographs will be assembled at the conclusion of the exposition in a traveling exhibit, to be displayed in the coming year throughout the United States and Canada.

Continued on page 32

Heat Treating Case Histories — Case No. 2

CONTROLLING AXLE DISTORTION THROUGH QUENCHING

SEARCHING for a way to control distortion, U. S. Axle Company, Pottstown, Pa., tested seven premium quenching oils before it found one that would meet specifications for distortion while providing the necessary uniformity of hardening.

U. S. Axle manufactures heavy duty earthmoving equipment axles and replacement automotive axles. The company also makes shafts for pumps and pulverizing machinery. Axles range up to 84 in. long. All products are heat treated, usually before machining, to toughen them. Standard materials used are AISI 4147 and AISI 4340 steels.

"We aim for complete martensitic structure, then temper it back to Brinell hardness of 415 to 444," says J. L. Orgill, Vice-President and Chief Metallurgist of U. S. Axle.

Orgill adds that the required hardness is obtained consistently with Gulf Super-Quench, the quenching oil selected after exhaustive tests. But he attaches over riding importance to the fact that quenching in this dual action oil holds longer axles to .060 total indicator reading, and to .030 TIR on the short ones.

With a quenching oil that controls distortion to this extent, subsequent straightening operations are reduced to a minimum.

The oil in U. S. Axle's three quench tanks is circulated at 500 gpm. Axles are heated to 1550 F., time depending on load size. Axles are then quenched, held between 110-115 F., and then tempered from 30 minutes upward depending on the size of the products.

Pump shafts are usually carburized and quenched in the smallest tank. For these, the heat treat department aims for 60-64 Rockwell C on the .060 in. case.

"We're getting consistent hardness and uniform depth of hardness," says Orgill.

With installation of modern straightening equipment, distortion control requirements in quenching have been reduced. "Even so," comments Orgill, "the less distortion in quenching, the better production rates you'll have."

A stub axle for heavy duty earthmoving equipment being lowered into Gulf Super-Quench at U. S. Axle Company, prior to matching. A complete martensitisc structure is aimed for, with axles then tempered back to Brinell hardness of 415-444. Company experience shows that use of dual action quenching oil obtains the required hardness consistently while holding distortion to a minimum.

Axles up to 84 in. long are manufactured by the U. S. Axle Company, creating distortion control problems in heat treatment. U. S. Axle, after exhaustive tests, selected Gulf Super-Quench as the one providing consistent uniformity of hardness and minimum distortion. The dual action quenching oil provides fast cooling in the initial hardening stage of quench and slow cooling over the final, or distortion, ranges of the process.

NEWS TO HEAT TREATERS...

Metal Treating Symposium

The first Metal Treating Symposium will be held in the New Englander Motor Hotel, Westport, Connecticut, on Thursday, November 3, 1960, 9:30 A.M.

Sponsored by the American Gas Association in cooperation with The Bridgeport Gas Company who will also act as host company, and other Connecticut utilities, this symposium will bring the metalworking and gas industries into closer harmony by meeting on common ground to discuss those subjects of heat processing aiming at more efficient production.

The program has been designed to appeal to top metallurgists and company officers in charge of plant production and speakers have been selected to present subjects of timely interest.

A feature of this one day meeting will be the luncheon speaker, Herman Steinkraus, chairman of the board, Bridgeport Brass Company, who will speak on "Foreign Competition". Steinkraus is a respected leader in the non-ferrous field and his message will bring important information to those attending the symposium.

Other subjects to be discussed by industry leaders are "The Effect of Natural Gas and Its Evolution in the Steel Industry," "Practical Problems of Heat Treating," "Modern Metals," "Basic Types of Gas Fired Metal Treating Equipment," "Gas Atmosphere Generators," and "Oven Applications."

Invitations have been sent to industrialists throughout the state of Connecticut by the utilities in their respective areas and the response to date points to a capacity audience.

For further information circle No. 13

New Pereco Furnace

Heat treaters requiring a high temperature furnace for either specific applications or for general purpose uses which call for long periods of sustained high temperatures will find the recently announced Pereco Model FGKS-1296 Kanthal Super Element Furnace of special interest. The manufacturer reports that their introduction of this unit was prompted by a specific demand.

They were getting calls for a unit that would operate at temperatures up to 2900 F. in normal oxiding atmospheres for heat treating, metal and glass melting, ceramic test work and similar applications.

This unit has a chamber size 12 in. by 8½ in. by 6 in. high, and is 37 in. wide by 40 in. deep by 64 in. high in overall size. Operating temperatures range from 500 F. to 2900 F. Kanthal Super Molydisilicide Elements are suspended equidistant around the work area. The hearth is pure alumina tile, supported on piers to permit heat circulation. Insulation of the heavy duty all welded steel case is 9½ in. graded, super-duty, light weight brick. The wall thick door is counter balanced.

The separate, matching steel panel containing all, completely wired, control instrumentation, includes a step-down transformer and saturable core reactor. As an alternate, a step-down transformer with a powerstat stepless transformer and a magnetic contactor is available.

For further information circle No. 14

Cleaning/Peening Unit

The Hemphill Spring Company of Los Angeles has installed a new type blast cleaning and peening machine, just released by Metal Improvement Company of Los Angeles, California. The unit has been designated Peenamatic Model 920. This machine was specifically designed to process small and medium sized parts of a great variety of shapes which could not be handled economically by conventional equipment.

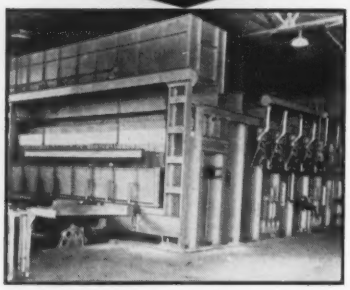
Hemphill Spring uses this blast cleaning barrel extensively to clean, deburr and shot-peen their springs. They have also found it very useful for adjusting the spring rate (stiffness) of finished springs by blasting with abrasive grit to achieve a

slight removal of metal. To improve the fatigue characteristics of their manufactured parts, they use the Peenamatic barrel with steel shot.

Shot and grit are easily changed in this machine. Parts are loaded into the easily removable hexagonal

Continued on page 24

FIRST CHOICE FOR PIPE ANNEALING



R-S CAST IRON PIPE ANNEALING FURNACES USED BY EVERY LEADING PIPE FOUNDRY

For more than 35 years leading producers of centrifugal cast iron pipe have relied on chain conveyor type annealing furnaces designed and built by R-S.

R-S experience goes back to the first centrifugal cast iron pipe produced in this country more than 35 years ago. Since then cast iron pipe annealing furnaces have been a specialty with R-S engineers. Their experience and development of furnaces to meet the needs of annealing cast iron pipe has kept pace with the industry. Today, R-S pipe annealing furnaces offer greater uniformity of heating through all ranges and precision controlled cooling.

R-S pipe annealing furnaces range in capacities from 15 to 35 tons per hour. Write for complete information on the newest developments in centrifugal cast iron pipe annealing by R-S.

R-S FURNACE COMPANY, INC.
NORTH WALES, PA.

R-S FURNACES

For further information circle No. 15

NEWS TO HEAT TREATERS

Continued from page 23

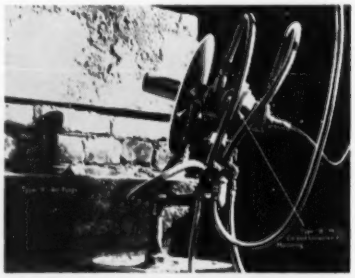
barrel which is then placed into the cabinet. After the lid is closed, the barrel is constantly rotated, exposing all sides of parts to the blast stream. Pressure is adjusted by regulator and gauge. A moisture trap and fiberglass dust bag are standard accessories.

Peenamtic Model 920 is compact, using only 2 ft. by 2 ft. floor space, with very modest requirements of only 30 CFM of air at 90 psi with a $\frac{1}{8}$ in. air jet. It can be connected to any 110 volt outlet.

For further information circle No. 16

Modern Advances in Temperature Control

Convenience and reliability of continuous temperature control in high ranges are said to result from the use of West-Land Radiation Pyrometers being marketed by West Instrument Corp. Applications include furnaces and kilns with temperatures of 1400 to 6000 F. and high temperature baths of problem liquids.



Control of temperature of the charge itself necessitates more than thermocouples. Optical pyrometers require skilled operators, permit only infrequent check and still leave much to chance.

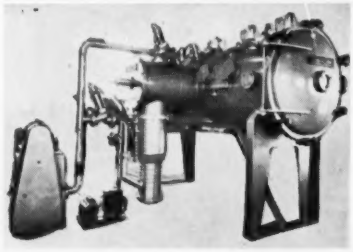
The West-Land radiation pyrometers provide continuous and accurate direct readings without requiring attention so long as the target area exceeds minimal standards. This avoids recalibration otherwise necessary when a growing charge passes through a kiln or blooms toward the scanning point of furnace or bath.

These instruments are calibrated to match the precision of the best base-metal thermocouples. They are temperature compensated, include emissivity adjustment and come in a wide selection of temperature ranges, scaled in fahrenheit or centigrade. A complete variety of accessories to suit any application is also available.

For further information circle No. 17

Hi-Vac Test Chamber

High Vacuum Equipment Corp., Hingham, Mass., has introduced a new product line of multipurpose self-contained environmental test chambers. With the addition of optional equipment, the chambers can be adapted to "dry box" welding. Cooling and heating equipment accessories are available to further expand the scope of the units.



The chambers are designed and engineered to specification and can be adapted to fit a multitude of jobs, one of which is electron beam welding. The chamber sizes often lend themselves nicely to the installation of the company's orbiting electron beam gun for doing closed loop welding or butt welding long tube sections which, because of configuration, cannot readily be moved but are held stationary while the electron beam gun is rotated.

For environmental testing purposes, a simulated rate of climb of 20,000 ft. per minute is accomplished by the use of a 16 in. pumping system. Provision is made for the addition of a second pumping system to further increase the simulated rate of climb, and series connected secondary diffusion pumps

are available for highest possible speed at very low pressures.

Additional features include adapters for installing any number of instrumentation circuits and multiple power circuits. The internal arrangement may be set up with rails, racks, or special apparatus to meet any application — either manual, power, or program controlled.

The pumping system is equipped with a sequence valve control which incorporates a single selector switch for control of the pumping cycle.

The control cabinet is provided with a graphic panel which shows immediately by indicator light when a valve or pump is opened or started.

The addition of glove ports allows for adjustment of the test vehicle or material within the tank by inletting dried inert gas and thereby avoiding contamination by normal atmosphere.

Illustrated here is a chamber 42 in. ID by 120 in. long with glove ports, feed throughs and sight ports. The HVEC 16 in. pumping system is shown on the left side of the tank.

For further information circle No. 18

Brazing Problem Solved

After extensive laboratory testing on actual production scale equipment in their Cranston, Rhode Island laboratory, C. I. Hayes research and development engineers evolved the design of this type BAC-12M Humpback Conveyor Furnace for controlled brazing of components for a new semi-conductor product.

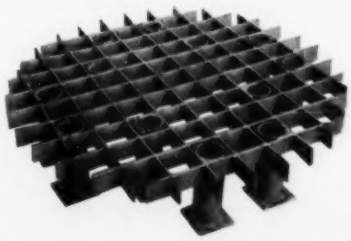
The application called for high-temperature brazing under hydrogen atmosphere—with the principal objectives of minimizing gases and impurities, and eliminating structural strains and distortion. Hayes engineers answered these job requirements with a furnace whose physical configuration features an elevated heating chamber with inclined loading and unloading sections. The inclined loading section of Type BAC-12M insures positive flushing and purging of the semi-conductor assemblies before they enter the heating zone. This flushing is a result of a counterflow action of the hydrogen atmosphere washing over the incoming parts, thus outgasing each piece before it enters the heating chamber.

The actual brazing operation involves selective reduction of oxides on engineered material to establish precise percentages of wetting and proper flow of the bonding material to the exact point desired. Conveyorized work feed on a 3 in. belt provides high production rates with minimum handling.

For further information circle No. 19

Special Parts Grid

A specially constructed grid for use in nicrobraze furnaces is now available from Wiretex Manufacturing Company, Inc., Bridgeport, Conn.



Made of Inconel, the grid is 40 in. in diameter and rests on 12 legs made of 3 in. O.D. pipe. The grid itself is fabricated of 8 in. bars placed upright. Joints are electrically welded with Inconel bars for maximum strength and temperature resistance.

Designed to hold workloads as heavy as 3,000 pounds, the grids have withstood temperatures as high as 2200 F.

Similar units are available in dimensions to meet specific job needs and can be constructed of a variety of alloys and metals.

For further information circle No. 20

NYTL Lab Guides

A unique, time saving monthly service called the *NYTL Laboratory Guide Reports,* will become available for the first time, this fall.

Of basic interest to engineers, physicists, chemists, metallurgists, instructors, quality control person-

Continued on page 28

DOW

BATCH FURNACES

CONTROLLED ATMOSPHERE EQUIPMENT FOR EVERY APPLICATION

STANDARD HEARTH SIZES

20" Wide—30" Long
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For further information circle No. 21

METAL TREATING

has moved its

business headquarters

MTI MASTER CRAFTSMEN METAL TREATING INSTITUTE

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DOW Washer for the above.

Roller Tables and many spare new furnace parts.

1 Electric Westinghouse Temper 19" O.D. x 22" deep-air operated lid — 30 KW-220 Volts, 3-Phase-Max. Temp. 1400° F.

1 HAYES Generator — IG 1001 BRH
1 IPSEN Fan motor for 400 Furnace
2 IPSEN 400 Fans
2 IPSEN 400 Muffles

1 INGERSOLL RAND Type ES 2 Gas Horizontal water cooled 2 stage compressor—9" and 4" x 9" stroke. 150# discharge—90 CFM, 25 HP motor 220 Volt, 3 Phase. Some new spare valve parts.

For further information contact:

Commercial Metal Treating, Inc.
89 Island Brook Avenue
Bridgeport 6, Connecticut

For further information circle No. 22

HEAT TREATING ANTI-AIRCRAFT RIFLES

THOMAS A. DICKINSON
Associate Editor

Salt bath tanks, believed to be the deepest in the world today, recently made it possible to give anti-aircraft rifle components an unprecedented heat treatment at Rohr Aircraft Corp., Chula Vista, Calif.

Work in this case was done for the United States Army's Watervliet Arsenal in New York. Rohr won the contract because its Ajax salt bath facilities were considered to be the only tanks of their type that were suitable for the vertical immersion of 15 ft. long rifle barrels.

Steel barrel for anti-aircraft gun is immersed in salt bath at Rohr Aircraft Corp., Chula Vista, Calif.

The objective was to determine whether a salt bath heat treatment could harden long rifle components without warpage, the principal reason for rejects after such parts are heat treated by other means.

Parts consisted of two castings and two forgings, all made from different types of steel for 75MM Sky-sweeper anti-aircraft rifles which respectively weigh 1,300 pounds and have an overall length of 177 in.

Vertical immersion of the components was deemed necessary to eliminate the tendency of gravitational forces to alter the straightness of barrels at elevated temperatures. A salt bath treatment was specified as the most likely method of preventing stresses. This was largely due to localized temperature variations.

To suspend and handle the components during each treatment, Rohr welded steel rod loops to the ends of all four parts and also installed a special collar and bail on two barrel units.

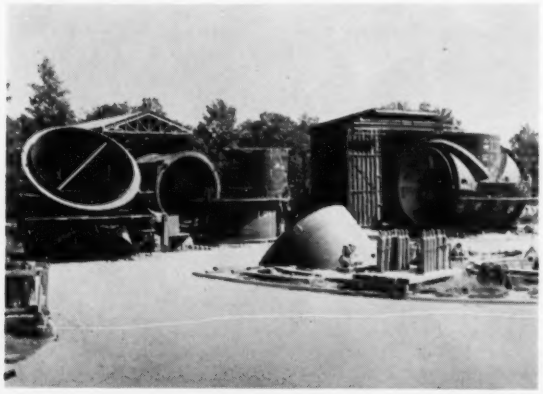
Despite differences in steels, the treatment that was

successfully used in connection with all four parts involved heating to 1575 F., a temperature that was maintained for 65 minutes. The forgings and castings then were respectively quenched at temperatures of 650 F. and 500 F. to assure maximum strength without distortions. ● ● ●

DID YOU KNOW THAT . . .

Furnaces that are taken to their work are not as unusual as the mountain that went to Mohammed, but one apparently comes close.

It is a big stress relieving facility recently constructed by the Consolidated Western Steel Division of U. S. Steel Corp., Los Angeles, at the new Arnold Engineering Development Center in eastern Tennessee. With its 20 ft. by 26 ft. by 32 ft. dimensions and ability to accommodate workpieces weighing up to 64 tons, it is believed to be the largest furnace of its type erected in the field.



Field furnace for stress of wind tunnel components at Arnold Engineering Development Center can be seen here at right, apparently dwarfed by 18 ft. high T-section. Actually, the latter section is small enough to be treated in the furnace. Structure at left is a welding shed.

As a rule, companies specializing in the fabrication of structural steel can avoid the need for such large field furnaces by prefabricating major components in their factories. In this case, huge dimensions specified for a hypersonic wind tunnel made it impossible to prefabricate parts to the point where no great amount of field welding would be required.

Consequently, the subject furnace had to be installed to stress relieve welded tunnel sections.

Following completion of the $300,000,000 Air Force development center, the big furnace may remain in use at its present location as a research and maintenance facility. ● ● ●

LIKE-NEW CONTINUOUS ATMOSPHERE BARGAIN FURNACES

Make	Fuel	Inside W"	L"	H"	Temp F.
E. F. CO.	11KW	6	36	4	2000
GE	29KW	12	36	10	2100
SARGENT	60KW	12	110	8	1900
HARPER	150KW	17	14'	7	2500
WESTING.	81KW	20	18'	20	1850
IPSEN	C200 GAS	24	36	12	1800
IPSEN	T500G	24	40	18	1800
E. F. C.	172KW, GAS	49	35'	14	2050

Also pits, rotary retorts, shaker hearths, salt pots, pyrometers, and testers. Write or call collect, for detailed proposals.

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For further information circle No. 23

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for normal oxidizing atmosphere

Model FGKS-1296

PERECO

Kanthal Super Element FURNACE

Here's a general-purpose Pereco Furnace especially suited for areas of work calling for sustained high temperatures (up to 2900 degrees F) for long periods. Some of its features are: Kanthal Super elements; saturable reactor power control; graded, super-duty, lightweight insulation; and highest quality temperature controls. These are combined to provide extremely accurate temperature contol, uniform heating, flexible cycling, cleanliness and economy of operating maintenance. Let us tell you how this unit—or other available size and type Pereco Kanthal units—might handle your work.

Standard and Special Furnaces for temperatures from 450 degrees to 3000 degrees F.

PERENY EQUIPMENT CO., INC.
Dept. O, 893 Chambers Road
Columbus 12, Ohio

For further information circle No. 24

NEWS TO HEAT TREATERS

Continued from page 25

nel, purchasing agents and salesmen, these informative reports are designed to bring quick authoritative answers to many typical problems encountered in laboratory procedures. Much of the information contained in these Reports is not readily available through ordinary channels.

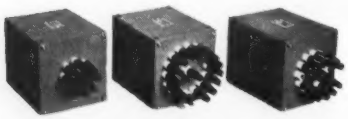
NYTL Laboratory Guide Reports will cut across all fields of industrial laboratory work and will cover not only conventional approaches, but the very latest in laboratory techniques as well.

Each month subscribers will receive at least four Guide Reports drawn from the more than 300,000 test programs conducted by New York Testing Laboratories at their New York headquarters.

For further information circle No. 25

Automatic Igniter Control

A new multi-burner igniter control, called the Ignitifier, has been developed by Protection Controls, Inc., Skokie, Illinois, the unit has widespread use for automatically firing up a network of gas burners in ovens, furnaces, boilers and heat-treating systems.



Unusual features include high-speed ignition which fires up 32 burners within 3 seconds, and its long life positive contact wiper switching design which eliminates arcing gap and wasted energy. When the unit is energized by a start button, a motorized double end shaft rotates its wiping contact against a series of stationary contact tips—one for each burner in the system. This causes a high voltage impulse from ignition transformer to be fed to each pilot spark electrode. This immediately ignites a gas-air mixture at each burner position. The unit repeats until all burners are ignited.

A special timing unit can also be incorporated to activate the motor at any desired intervals for continuous intermittent, or variable timed ignition.

Standard units are for operation at 5,000 or 6,000 volts with 10,000 or 12,000 volts available as special units. Cable connections to pilot spark electrodes are porcelain-insulated to prevent burnouts or high voltage breakdown. Ignitifiers are available in modular capacities of 8, 12, 16, 20, 24, 28 and 32, and components are interchangeable with higher capacity units to ignite additional number of burners when systems are subsequently enlarged. The units can be mounted in any position.

For further information circle No. 26

Lindberg Installs Gantry

A new Gantry type furnace and associated equipment is now installed at Lindberg Steel Treating Company's Los Angeles, California facilities.

This unique atmospheric controlled, bottom quench, gantry-type hardening furnace accommodates a loading fixture with an effective work load of 80 in. in diameter by 192 in. in length. Lindberg's gantry furnace will be electrically heated, will have three control zones of 115 KW each, and will operate between 250 F. and 2050 F.

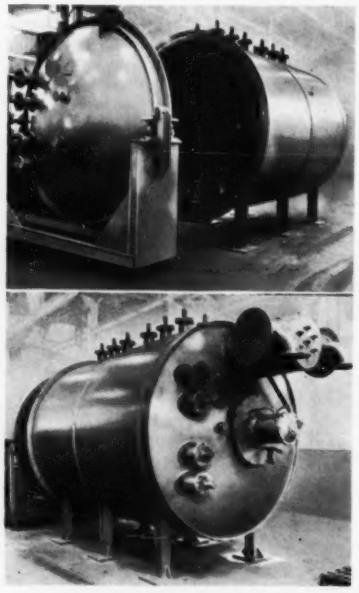
According to company officials, L. A. Lindberg, president, George H. Bodeen, vice president, and Robert W. Fish, west coast division manager, the new facilities were scheduled to be completed in their specially designed new building in early August.

"Increased use of the Lindberg way as the preferred method for heat treating the metals of today and tomorrow has helped bring about this newest Lindberg Steel Treating Company expansion," Bodeen stated, "and this unique gantry hardening furnace installation will greatly increase our ability to serve a wide variety of present and potential western customers, especially in the airframe, missile, and rocket industries."

For further information circle No. 27

Giant Cold Wall Furnace Shipped to Convair

High alloy steels used in the production of the Atlas intercontinental ballistic missile will be heat treated and brazed under high vacuum at temperatures over 2200 F. in this large furnace which has just been



shipped to Convair Astronautics Division of General Dynamics Corporation, San Diego, California, by the builders, F. J. Stokes Corporation, Philadelphia.

The furnace, which is the largest cold wall vacuum heat treating system ever built capable of operation at temperatures of 2250 F., has a chamber 9 ft. in diameter and 12 ft. long that will be evacuated to working pressures of about ½ micron. Within the chamber is a uniform temperature work zone about 6 ft. in diameter and 10 ft. long.

The chamber is fully water jacketed, and is so constructed that no

interior welds are exposed to the water. Multiple layers of reflective material provide radiation shielding around the work zone. For rapid cooling of the work, inert gas is circulated through the work zone by a large capacity fan with blades of special heat resisting material.

To minimize floor space requirements, the heavy door, nearly 10 ft. in diameter, is not hinged, but is mounted on a special carriage. This permits it to be backed away from the chamber and then rolled to one side.

For further information circle No. 28

Wide Plate Line

Though a previously installed heat treating line, in operation since 1958, has been handling both bar and plate up to 72 in. wide, the Sheffield Division of Armco Steel Corporation is now gearing up at their plant near Houston to continuously heat treat plate up to 160 in. wide. An order has been placed with Drever Company, Bethayres, Pa., who installed the original equipment, for a continuous wide plate line which will be housed in its own building at the Sheffield plant.

About 500 ft. in length, the line will consist of a 54 ft. charge table, 135 ft. hardening furnace, 6 ft. conveyor table, 50 ft. pressure quench, 50 ft. side transfer car, 153 ft. tempering furnace (reversible heating), another 50 ft. side transfer car, and a 158 ft. conveyor table (parallel to the tempering furnace).

In operation, the large conveyor table will be used to by-pass the tempering furnace or for re-passing the plate through the tempering unit. A 24,000 gpm water supply system with a 250,000 gallon reservoir provides water for the pressure quench. The furnaces are direct fired.

The line will be fully automatic, push button supervised from an air conditioned control room, with closed circuit television monitoring and phone intercommunication. Working under the direction of the control room operator will be a hook man at each end of the line, and an overhead crane operator.

For further information circle No. 29

Alnor Pyrotroller

An accurate, new, electronic on-off controller and pyrometric temperature indicator is available in a single, compact instrument from the Alnor Instrument Company, Division of Illinois Testing Laboratories, Inc.

Called the Alnor Pyrotroller, the unit has been designed for use on ovens, heat treating furnaces, environmental test chambers, die casting machines, injection molding machines, extrusion presses, heat sealing machines, and a multitude of processes requiring precise continuous control.

The Pyrotroller is suitable for original equipment application as well as field application. The small space required by the instrument case, only 6⅜ in. by 7 in., makes it a highly desirable panel board instrument.

The instrument case of die cast aluminum with black enamel finish and satin trim is designed for flush mounting.

The controller is available in eleven ranges from 0-400 F. to 0-3000 F., as well as an environmental test chamber range of -100 to +300 F.

The Alnor Pyrotroller is currently offered in single and double target models.

For further information circle No. 30

Electro-Alloys Announces High Temp Supertherm

Electro-Alloys has developed a new high temperature alloy through its research laboratories in Mahwah, New Jersey.

Trade named Supertherm, the new alloy has been extensively field tested and proved outstanding for service in temperatures ranging up to and including 2300 F.

With superior high temperature properties and good foundry and weldability characterisitics, the alloy is expected to find broad applications within the 1800 to 2300 F. service range. Among prime immediate applications: heat treat furnace parts for the steel and automotive industries, tubes for the chemical industry, cement kiln parts, smelting furnace and calcining furnace parts.

For further information circle No. 31

Bliss Inspirator Burners

E. W. Bliss Company, Canton, Ohio has announced a redesigned line of inspirator burners. Known as the HP 220 Series, they are suited

Continued on page 38

TODAY THE TREND IS UP

Modern specifications call for better properties achieved by better heat treating —check with your commercial heat treater

Whenever a modern product is improved or a new one developed it has now reached a point where the heat treating procedures and processes to be applied to basic component parts are among the original factors to be considered. In the past, fabricating methods and metals were frequently the first to be specified and heat treating, if involved at all, was a secondary problem.

Because of this and because of the new and exceptional design characteristics and ultimate engineering properties which can be achieved only through skillful and accurate heat treating, the tonnage volume of heat treating materials processed by the commercial heat treating industry grows steadily month after month.

There is another reason for this and it is found in the fact that only the commercial heat treater offers practically an all inclusive diversity of plant facilities, but even more important, the accumulation of technical skills, experienced personnel, and the background of knowledge so essential to this field.

If you would like to receive a charted monthly report of the volume of activity in this industry, write us on your company letterhead. We will be glad to send it to you.

Whatever your heat treating problem, always check with your commercial heat treater first.

THERE'S A HEAT TREATING SPECIALIST NEAR YOUR PLANT

ALABAMA

Southern Metal Treating Co., Inc.
3131 10th Ave. N., Birmingham 4

CALIFORNIA

Downey Steel Treating Co., Inc.
9637 Nance St., Downey
National Heat Treating Co., Inc.
1833 W. Florence, Inglewood 1
Certified Steel Treating Co.
2454 E. 58th St., Los Angeles 58
Lindberg Steel Treating Co.
2910 S. Sunol Drive, Los Angeles 23
Cook Induction Heating Co.
4925 East Slauson Ave., Maywood

CONNECTICUT

Commercial Metal Treating, Inc.
89 Island Brook Ave., Bridgeport 6
Stanley P. Rockwell Co.
296 Homestead Ave., Hartford 12
Ireland Heat Treating Co.
512 Boston Post Road, Orange

ILLINOIS

Accurate Steel Treating Co.
2226 W. Hubbard St., Chicago 12
Allied Metal Treating Corp. of Illinois
333 N. California Ave., Chicago 12
Dura-Hard Steel Treating Co.
2112 W. Rice Street, Chicago 22
Perfection Tool & Metal Heat Treating Co.
1756 West Hubbard St., Chicago 22
Fred A. Snow Co.
1942 West Kinzie St., Chicago 22
American Steel Treating Co.
P. O. Box 396, Crystal Lake
Lindberg Steel Treating Co.
1975 N. Ruby St., Melrose Park
Eklund Metal Treating, Inc.
721 Beacon St., Rockford
Scott Ford, Inc.
2719 Fifth St., Rock Island
Ipsenlab of Rockford, Inc.
2125 Kishwaukee Street, Rockford
O. T. Muehlemeyer Heat Treating Co.
1500 Preston St., Rockford

INDIANA

Quality Steel Treating Company
1630 Locust Street, Anderson
Industrial Heat Treating & Metallurgical Co., Inc.
2131 Northwestern Ave., Indianapolis 2

MASSACHUSETTS

Kinetics Corporation, a Division of High Vacuum Equipment Corp.
2 Churchill Road, Hingham
Porter Forge & Furnace, Inc.
74 Foley St., Somerville 43
New England Metallurgical Corp.
475 Dorchester Ave., South Boston 27
Springfield Heat Treating Corp.
99 Margaret Street, Springfield
Greenman Steel Treating Co.
284 Grove St., Worcester 5

MICHIGAN

Anderson Steel Treating Co.
1033 Mt. Elliot Avenue, Detroit 7
Bosworth Steel Treating Co.
18174 West Chicago Blvd., Detroit 28
Commercial Steel Treating Corp.
6100 Tireman Ave., Detroit 4
Commonwealth Industries, Inc.
5922 Commonwealth Ave., Detroit 8
Vincent Steel Process
2424 Bellevue Ave., Detroit 7
State Heat Treat, Inc.
520 32nd Street, S. E., Grand Rapids 8
Royal Oak Heat Treat, Inc.
21419 Dequindre, Hazel Park

MISSOURI

Lindberg Steel Treating Co.
650 East Taylor Ave., St. Louis 15
Paulo Products Co.
5711 West Park Ave., St. Louis 10

NEW JERSEY

Fred Heinzelman & Sons, Inc.
790 Washington Avenue, Carlstadt
American Metal Treatment Co.
Spring and Lafayette Sts., Elizabeth
Benedict-Miller, Inc.
Marin Ave. & Orient Way, Lyndhurst
Bennett Heat Treating Co., Inc.
246 Raymond Boulevard, Newark 5
L-R Metal Treating Corp.
107 Vesey St., Newark 5
Temperature Processing Co., Inc.
228 River Road, North Arlington

NEW YORK

Owego Heat Treat, Inc.
Rural Route 1, Apalachin
Eastern Heat Treating & Brazing Corp.
44 Sea Cliff Avenue, Glen Cove
Alfred Heller Heat Treating Co., Inc.
391 Pearl St., New York 38
Lindberg Steel Treating Co.
620 Buffalo Road, Rochester 11
Rochester Steel Treating Works
962 Main Street, E. Rochester 5
General Heat Treating Corporation
206 Sand Street, Syracuse 3
Syracuse Heat Treating Corp.
1223 Burnet Ave., Syracuse 3

OHIO

Queen City Steel Treating Co.
2980 Spring Grove Ave., Cincinnati 11
Ferrotherm Co.
1861 E. 65th St., Cleveland 3
Lakeside Steel Improvement Co.
5418 Lakeside Ave., Cleveland 14
The Modern Steel Treating Co.
5466 Lake Court, Cleveland 14
George H. Porter Steel Treating Co.
1273 East 55th Street, Cleveland 3
Reliable Metallurgical Service, Inc.
3827 Lakeside Ave., Cleveland 14

OHIO — (Cont'd)

Winton Heat Treating Co.
20003 Lake Road, Cleveland 16
Dayton Forging & Heat Treating Co.
2323 East First St., Dayton 3
Ohio Heat Treating Co.
1100 East Third St., Dayton 2

PENNSYLVANIA

Drever Company
Red Lion Rd. & Philmont Ave., Bethayres
Robert Wooler Company
Dresher
Wiedemann Machine Co.
Gulph Road, King of Prussia
J. W. Rex Co.
Eighth and Franconia Avenue, Lansdale
Lorenz & Son
1351 N. Front St., Philadelphia 22
Metlab Company
1000 E. Mermaid Lane, Philadelphia 18
Pittsburgh Commercial Heat Treating Co.
49th St., and A.V.R.R., Pittsburgh 1
Pittsburgh Metal Processing Co., Inc.
1850 Chapman Street, Pittsburgh 15

TENNESSEE

Mid-South Metal Treating Co.
463 Scott St., Memphis 12

TEXAS

Dominy Heat Treating Corp.
P. O. Box 5054, Dallas
Superior Heat Treating Co., Inc.
P. O. Box 69, Fort Worth 1
United Heat Treating Company
2005 Montgomery Street, Fort Worth 7
Cook Heat Treating Co., of Texas
6233 Navigation Boulevard, Houston 11
Houston Heat Treating Company, Inc.
2100 Quitman Street, Houston 26
Lone Star Heat Treating Corp.
5212 Clinton Dr., Houston 20

WISCONSIN

Allied Metal Treating Corp.
P. O. Box 612, Milwaukee 1
Heat Treating Engineers, Inc.
1146 North 54th St., Milwaukee 8
Metal Treating, Inc.
720 South 16th St., Milwaukee 4
Supreme Metal Treating Co.
4440 West Mitchell St., Milwaukee 14
Thurner Heat Treating Co.
809 West National Ave., Milwaukee 4
Wisconsin Steel Treating & Blasting Co.
1114 South 41st Street, Milwaukee 15
Harris Metals Treating Co.
4100 Douglas Ave., Racine

CANADA

Ipsenlab of Canada Limited
27 Bermondsey Road, Toronto 16, Ont.

For further information circle No. 32

All of the above listed firms are members of the

METAL TREATING INSTITUTE

271 North Avenue, New Rochelle, N. Y.

FOCUS . . .

Concluded from page 21

WILSON MECHANICAL INSTRUMENT DIVISION

Booth 1330

Wilson Mechanical Instrument Division, American Chain & Cable Company, Inc., will exhibit a complete line of Rockwell and Rockwell Superficial hardness testers and Tukon testers for micro and macro testing. Two new hardness testers will be featured. A new model for testing hardness of materials at elevated temperatures and their new mobile tester for Rockwell testing large or bulky materials that cannot be brought to a tester.

The new elevated temperature model is available for either Rockwell or Rockwell superficial testing at temperatures up to 1800 F. It is equipped with a water cooled induction type furnace which can be indexed by means of handwheels to make a series of indentations in different locations on the specimen being tested. The temperature can be controlled either automatically or manually and will handle specimens to be tested up to 2 in. in diameter and 4 in. in length. It comes equipped with a transformer and voltage regulator with controls.

E. F. HOUGHTON & CO.

Booth 709

Four new production line cleaners developed by E. F. Houghton & Company will be exhibited at the National Metal Exposition.

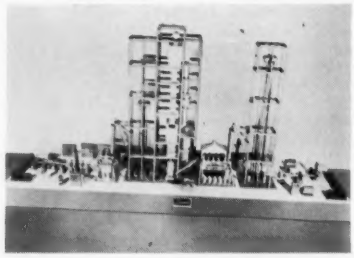
The Cerfa-Kleen series is said to greatly simplify the purchase and use of metal cleaners, as the four formulations can handle almost any type of metal cleaning. Each one effectively meets the requirements of one of the four basic cleaning processes — hot and cold power washers and soak tanks.

Other products from the Houghton line to be shown are liquid heat salt baths, Hocut 237 synthetic machining coolant and the company's line of rust preventives.

SURFACE COMBUSTION

Booth 1540

A 10 ft., scaled model of a Surface single pass strip processing line for ferrous and non-ferrous metals will be on display in the Surface Combustion exhibit at the National Metal Show.



The Surface booth will also feature the latest standard and special industrial furnace developments for the heat treatment of metal products.

Two additional Midland-Ross Divisions will also participate in the Surface booth. These divisions, Ross Engineering and Waldron-Hartig, will present a "Ross-Waldron" strip coating line model.

GENERAL ALLOYS COMPANY

Booth 930

A uniquely designed, interchangeable gas carburizing or carbo-nitriding fixture for treating gears will be featured by General Alloys Company at the coming A. S. M. Metal Show in Philadelphia. In keeping with the advance billing of a bigger and better show, General Alloys will also feature a new fabricated corrugated muffle design, new mallablizing tubular tray design, a new gas carburizing fixture design for gear loading, a new combination cast and fabricated radiant tubes, cast corrugated muffle, cast carburizing trays, fixtures, annealing and normalizing trays, spiraling conveyor belts, furnace parts and stainless steel castings and fabrications will be on special display.

SELAS CORPORATION

Booth 1910 A

The Selas exhibit will feature products of special interest to designers, manufacturers and users of equipment for semi-automated and automated heat processing of metals.

The overall theme of the Selas exhibit will feature automated and semi-automated gas fired equipment for heat treating, heating for hot working, selective heating, and brazing and soldering, as well as a combustion system for performing these and other processes. An operating unit displaying Selas combusion components in use will demonstrate aluminum brazing and silver brazing and selective heating.

Another highlight of the exhibit will be an operating unit which demonstrates continuous heating of long steel bars and tubes. Use of a cut off saw and forge press will illustrate coordination with subsequent hot working operations on continuous automated basis.

Selas will also introduce its Qual-O-Rimeter, a new aid to combustion control. It will be in operation, continuously indicating changes in flame characteristics of fuel gas-air mixtures, sampling directly and continuously from the gas-air fuel mixture supply line.

Also shown will be a high temperature furnace for heating tungsten, molybdenum and other refractory metals at 3500 F. and above, using natural gas-air mixture.

THE METLAB COMPANY

Booth 1044

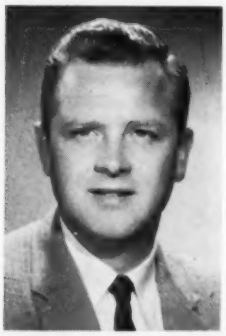
The Metlab Company, *1000 E. Mermaid Lane*, Philadelphia, will exhibit examples of the wide variety of heat treating services which they offer industry both locally and nationally. Mr. Horace Knerr, President of the company, advises that the booth will feature the famous *"One Grand Mermaid"* who will be there to help explain the many heat treating services available. The booth will also have available sample copies of METAL TREATING magazine and subscription cards for distribution to those interested.

Mr. Knerr serves as Chairman of the Publication Committee of the magazine and will be delighted to talk to authors and others interested in the activities of METAL TREATING.

About People.....

Hocker and Weitzel Join Heatbath as Sales Reps

The appointment of Don Hocker and John W. Weitzel as technical sales representatives for Heatbath Corp. has been announced by Donald R. Barber, general manager.



Don Hocker

Hocker will promote the Heatbath line in southern Indiana, Cincinnati, Ohio, and the Kentucky area. He will headquarter at the company's Indianapolis, Indiana offices.

John W. Weitzel

Weitzel, a graduate of St. Joseph's college, was formerly associated with Diversey Corp. His territory will consist of the states of Delaware and Maryland and eastern Pennsylvania. His headquarters will be at 930 Bridge Street, Philadelphia.

Stanwood Maryland Rep

The appointment of Gordon C. Jensen as sales representative for the state of Maryland for Stanwood Corp. was announced recently.

In his new position, Jensen, a native of Baltimore, will handle the complete line of Stanwood products.

Armour Distributors

Two new ammonia distributors have been appointed by Armour Industrial Chemical Company, according to P. W. Fulford, ammonia sales manager.

McKesson & Robbins, Inc., 1795 South High Street, Columbus, Ohio, and The Thompson-Hayward Chemical Company, 3909 South Meridian, Oklahoma City, Okla., have been named authorized distributors for Armour anhydrous ammonia.

Both companies will handle sale of ammonia in cylinders and tank truck quantities.

The recent additions bring the number of Armour ammonia distribution points to 185.

To Represent Sunbeam

The addition of Matheson-Doherty Company, 225 Shaw Road, South San Francisco, California, as a member of the growing Sunbeam family has been announced.

Matheson-Doherty will market the entire Sunbeam line of industrial furnaces and equipment in the northern half of California.

Vana to Head Gas Atmospheres Research

Charles A. Vana, internationally recognized authority on the application of protective gases, has been named director of research at Gas Atmospheres, Inc., Cleveland, Ohio.

Vana served as supervisor of research for E. I. du Pont de Nemours & Company and the Ferro Corp. for 20 years. He has recorded many patents, some world-wide, and his diversified experience in the chemical field rates listing in the

Charles A. Vana

Men of Science treatise. His most recent research developed a packaged hydrogen generator and inert generator to produce high purity preservative gases for the food industry.

In directing research on inert and hydrogen gas generators at Gas Atmosphers, Vana's research objective is expected to further expand the application of protective atmospheres in modern industrial technology.

Sunbeam President

Vincent R. Troglione has been elected President of Sunbeam Equipment Corp., succeeding H. C.

V. R. Troglione

Gwinn, who has been named chairman of the board of directors. Troglione was vice president and general manager of the Meadville Industrial

Continued on next page

ABOUT PEOPLE

Continued from page 33

Furnace Company before becoming its President.

Troglione is a member of the Association of Iron and Steel Engineers and is a registered professional engineer in Pennsylvania.

Despatch Oven Appoints Lindstrom Exec Post

Leonard J. Lindstrom has been appointed manager of engineering and research of Despatch Oven Company, Minneapolis, Minnesota.

Leonard J. Lindstrom

In his new position Lindstrom will be responsible for all engineering of the Despatch line of industrial furnaces, finish baking ovens, paint sprayers, metal cleaning equipment, foundry ovens, and chemical ovens. He will also head up engineering and research for the Despatch line of laboratory ovens, furnaces, and the bakery oven line, according to A. T. Substad, general manager of the firm.

New ACI President

E. A. Schoefer, executive vice president, Alloy Casting Institute, has announced the election of new executives of the Institute to serve during the 1960-61 fiscal year. Officers were elected at the Institute's 20th Annual Meeting held recently at The Homestead, Hot Springs, Va. As the trade association of the high alloy foundry industry, the Alloy Casting Institute comprises most of the leading producers of stainless castings.

Elected to the office of president was J. D. Hagans, sales manager, The Ohio Steel Foundry Company, Springfield, Ohio. He succeeds J.

J. D. Hagans

B. Dear, sales manager, The Duraloy Company, Scottdale, Pennsylvania.

Hagans has been extremely active in the alloy foundry industry generally, and in the Alloy Casting Institute in particular. He has been associated with the Institute since 1943, and has served on its board of directors three times.

To Supervisor Post

The promotion of Eugene D. Boone to the position of supervisor of electro-mechanical assembly at Pacific Scientific Company's Anaheim, California division has been announced.

Boone was formerly service manager of the aeronautical division at the company's Bell Gardens plant. Eugene has been affiliated with Pacific Scientific for over 19 years.

To New Crucible Post

T. M. Rutter

T. M. Rutter has been appointed manager of promotion for Crucible Steel Company of America. He was formerly supervisor of sales promotion and technical literature and company displays.

Rutter has been with Crucible since 1952 when he joined the company as senior industrial engineer. In 1954 he was transferred to the advertising department as staff assistant, creative writing. He became supervisor of sales literature and company displays in 1958.

General Works Manager

R. C. Conover has been named general works manager, refractories division, H. K. Porter Company, Inc., according to a recent announcement.

Conover was previously western district works manager for the Porter refractories division. In his new position he will supervise operations of the division's 15 refractories plants, located in Alabama, Ohio, Colorado, Pennsylvania, Missouri, Illinois, Connecticut and Mississippi.

A graduate of the University of Illinois with a degree in ceramic engineering, Conover has spent his entire career in the heavy clay products and refractories industries. As general works manager for Porter, he will operate from the division's Pittsburgh headquarters.

L & N Expansion Plans

Plans to establish two more branch offices and four new residencies have been announced by Harold L. Scutt, sales division manager of Leeds & Northrup Company.

Scutt said new branches soon will become operative at Dallas, Texas and East Chicago, Indiana, while new residencies will be set up at Syracuse, New York, Minneapolis, Minnesota, San Diego, California and Phoenix, Arizona. In addition, Scutt said the company has expanded its North Jersey office at East Orange, New Jersey, from branch status to district office.

The new arrangement will give

Continued on page 36

PEANUTS?

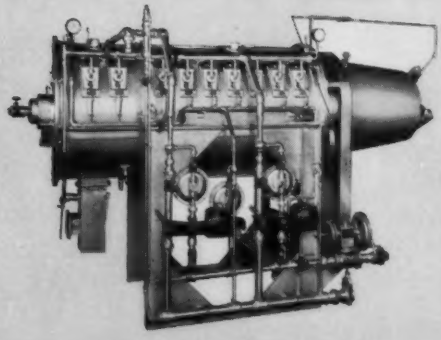
SAVINGS AREN'T PEANUTS when you harden small parts with an AGF AUTOMATIC ROTARY FURNACE

Tony, the Peanut Man, long ago applied the "work in motion" principle—crudely, but effectively—by using a rotating drum to UNIFORMLY roast each and every peanut.

IN 1902 American Gas Furnace Co. developed the first rotary retort furnace to incorporate the advantages of the "work in motion" principle.

TODAY the new improved line of "AUTOMOTION"® rotary furnaces provides controlled atmosphere, automatic heat treating of small parts, and assures you of a furnace with long-life and trouble-free operation.

- LOWER INITIAL COST. Design standardization results in lower production cost, which AGF passes on to you.
- LOWER OPERATING COST. Automatic feeder hopper reduces operating and work handling costs.
- LOWER MAINTENANCE COST. Conveyors and other troublesome conveying devices are eliminated.
- NO COSTLY ADDITIONAL FEEDERS ARE NECESSARY.
- GREATER ADAPTABILITY. 600° to 1800° F. operation permits processing of ferrous and non-ferrous materials.
- LESS VALUABLE FLOOR SPACE NEEDED. Compact design uses minimum of floor space — far less than any conveyor type furnace.



The "work in motion" principle of the peanut roaster scientifically refined and applied—produces the same COMPLETELY UNIFORM result to small parts heat treated in the illustrated AGF "Automotion" Rotary Retort Furnace Model No. 136MGE.

82 YEARS OF PIONEERING 1878 1960 ELIZABETH, N. J.

AMERICAN GAS FURNACE CO. PIONEERS 1878

CODE OF ETHICS SIGNER

Over 82 Years of Quality Craftsmanship and Furnace Building Experience. Write Today for Complete Details on The New "Automotion" Series of AGF Rotary and Shaker Hearth Furnaces

See Us at The Metals Show, October 17-21, Booth 1910B

AMERICAN GAS FURNACE CO.

808 LAFAYETTE STREET — ELIZABETH 4, N. J.

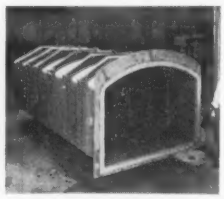
For further information circle No. 33

Custom FABRICATORS

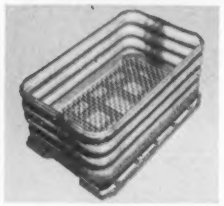
DESIGNERS OF SPECIAL EQUIPMENT

High alloy such as RA-330, Hastelloy and Inconel—for the heat treating industries . . . a plant with over 50 years experience as fabricators, and grey iron castings. Illustrated above is Venturi-High Temperature Alloy.

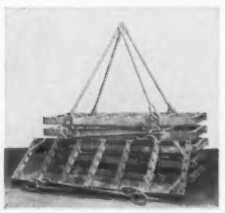
Alloy muffle . . . example of one type fabrication job.



Corrugated baskets.



Pickling racks.



Fully illustrated colored brochure shows many types of Custom Fabrication . . . write for it today.

BERLIN CHAPMAN CO. Since 1908

Division of BERLIANA CORP.

BERLIN • WISCONSIN

For further information circle No. 34

ABOUT PEOPLE

Continued from page 34

L & N personal sales representation at 41 locations throughout the United States.

Crucible Staff Assistant

David K. Stuart has been appointed staff assistant to the Assistant general sales manager, field sales, at the Crucible Steel Company of America. He was formerly manager of the Chicago sales branch.

Stuart joined Crucible in 1933 as order expediter in the sheet and bar mills at the company's Park Works in Pittsburgh. In 1935 he was named sales service engineer at the Pittsburgh sales branch. In 1950 he became manager of that department. He was promoted to Chicago branch manager in 1957.

Before joining Crucible, Stuart was employed in the purchasing department of Commercial Shearing & Stamping Company and later was district sales manager for J. H. Filbert Company.

A native of Youngstown, Ohio, Stuart attended Williams College and Carnegie Institute of Technology. He also attended Culver Military Academy.

He is a member of the American Steel Warehouse Association and American Society for Metals.

Egloff and Graper To Be Denver Fire Clay Reps.

The appointment of Egloff and Graper, Inc., Los Angeles, as Southern California representatives for Denver Fire Clay Company has been announced by the Mile High City firm.

Egloff and Graper will handle Denver's complete line of gas and oil burners as well as all types of furnaces ranging from forges to continuous atmosphere controlled shaker furnaces.

To Corporate Post

Latrobe Steel Company has announced the promotion of John Wandrisco, to the position of vice president in charge of corporate planning.

In announcing Wandrisco's new position, J. E. Workman, Latrobe Steel president, said the company is placing marked emphasis on new products, new markets which can help the company take the greatest advantage of rapid changes in products and processes.

A graduate of Massachusetts Institute of Technology and the Harvard Graduate School of Business, Wandrisco joined Latrobe in 1951 as assistant to the vice president in charge of sales, later serving as general manager of the special products division and manager of marketing before moving to the president's office.

He is a member of the American Iron and Steel Institute, American Marketing Association and the American Management Association.

Corporate Name Notice

Illinois Testing Laboratories, Inc., 50 year old Chicago manufacturers of temperature, air and dew point indicating and controlling instruments, power supplies, transducers and related apparatus, announce that in the future the firm will be called Alnor Instrument Company, Division of Illinois Testing Laboratories, Inc. The address at 420 N. LaSalle St., Chicago 10, Illinois remains unchanged.

The new name has been adopted to convey more accurately the nature of Alnor's production.

Koelsch to V-P

Carl Koelsch has been appointed vice president in charge of marketing of industrial furnaces and plating equipment by Metal Treating Equipment Exchange, Inc., Detroit, Michigan.

His major responsibility will be the distribution of equipment from 32 warehouses located across the nation. The purpose of this wide spread operation is to effect lower transportation costs to the consumer.

Before joining the staff of the Metal Treating Equipment Exchange, Koelsch had been affiliated with Sharon Steel & Reynolds Metals.

Appointment of Koelsch to the position of vice president in charge of marketing is expected to increase the efficiency and traffic flow of what is considered in metal treating circles one of the best operations of its type in the industry.

SURPLUS FURNACES

— Only Partial Listing —

Send in YOUR Inquiry, Today!

BOX FURNACES—

12" x 26" x 12", HOSKINS, w/controls, 16KW, 1850°F.
15" x 30" x 9", HAYES, ATMOS, LR71, 18KW, 1850°F.
15" x 30" x 12", LIND. GLOBAR, ATMOS, 50KW, 2500°F.
18" x 32" x 12", MAHR, GAS, FULL MUFFLE, COMP. 1850°F.
24" x 14" x 4", GEN. ELEC. GLOBAR, 220, 40KW, 2300°F.
24" x 36" x 14", SURFACE COMB, GAS, COMP. 1800°F.
24" x 48" x 18", WEST, ATMOS. HG-24, 45KW, 2000°F. COMP. W/ALLOY HEARTH, NEW ELEMENTS, L&N CONTROL
26" x 48" x 12", HAYES, ATMOS. LR900S, 44KW, 1850°F.

DRAW FURNACES, RECIRCULATING—

24" x 35" x 20", DESPATCH, (3) 37KW or GAS, 1200°F.
24" x 36" x 18", LINDBERG, 35KW, 1200°F. L&N CONT.
25" x 30", LIND, 66KW, 1250°F, BASKET, L&N CONT.
28" x 50", LINDBERG, GAS, 1400°F., NEW BRICKWORK
33" x 36", LINDBERG, GAS, 1250°F, BASKET, L&N CONT.

ATMOSPHERE GENERATORS—

500 CFH LINDBERG ENDO, GAS, W/PANEL, LIKE NEW
500-2000 CFH GEN. ELEC. EXO. (11) REBUILT
1500 CFH BAKER NITRONEAL, .2%/25% H_2, BAL. N_2

PIT CARBURIZERS—

12" x 24" HEVI DUTY, 36KW, 1850°F. 2 ZONE CONT. MOTORIZED DOOR, 2 SETS BASKETS, L&N "S" & "C"
24" x 48" HEVI DUTY, MOD. HD-244B, 107KW, 1850°F. 3 ZONE CONTROL WITH 3 BROWN ELECTRONIK CONT. 2 BROWN PROTECTO-VANES, MOTORIZED LID LIFTER
25" x 36", L & N, 2, MOD. 9775-36-10, 100KW, 1750°F. REBUILT WITH NEW ALLOY RETORT, L&N CONTROLS
28" x 48", A.G.F. CO. GAS FIRED FOR 1850°F. FULL ALLOY RETORT, AIR OPER. LID WITH FAN IN TOP BROWN ELECTRONIK CIRCULAR CHART REC. CONT.

SALT BATHS—

16" x 18", HONES, GAS, 1650°F., STEEL POT, NEW
16" x 18", AM. ELEC. 2, 27KW, 1700°F., ALLOY POT
15" x 36" x 20", HOLDEN, 60KW, 1650°F., COMP. W/L&N

VERTICAL BELL RETORT (FOR HYDROGEN)—

25" x 48", A.G.F. CO. (2) GAS FIRED FOR 2150°F. BROWN ELECTRONIC REC. CONT. ALLOY RETORTS AND WORK BASKETS, BLOWER, FOR ALL TYPES OF ATMOS. WORK, CARBONITRIDING AND HYDROGEN BRAZING.

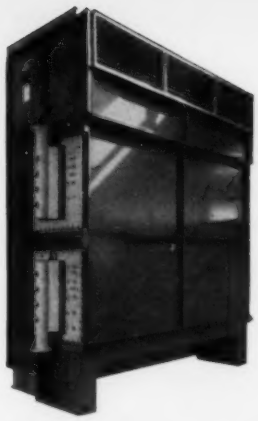
All Furnaces are Guaranteed and Complete

HOLSTEIN ENGINEERING

20607 Stephens, St. Clair Shores, Mich. PR. 8-4234

WE BUY FURNACES THAT ARE IN GOOD CONDITION

For further information circle No. 35



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● Use the NIAGARA AERO HEAT EXCHANGER to control the temperature of your quench bath and you remove the heat *at its rate of input,* always quenching at the exact temperature that will give your product the best physical properties.

The Niagara *Aero* Heat Exchanger transfers the heat to atmospheric air by evaporative cooling. It extends your quenching capacity without using extra water. It pays for itself with water savings.

You can cool and hold accurately the temperature of all fluids, gases, air, water, oils, solutions, chemicals for processes and coolants for mechanical and electrical equipment. You get closed system cooling, free from dirt and scale.

Write for Bulletins 120, 124, 132

NIAGARA BLOWER COMPANY

Dept. MG-10, 405 Lexington Ave., New York 17, N. Y.

District Engineers in Principal Cities of U. S. and Canada

For further information circle No. 36

NOTHING heats like...
is more modern than...
is more economical than... **GAS**

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BUZZER
REG. U.S. PAT. OFFICE
JUST CONNECT TO GAS SUPPLY

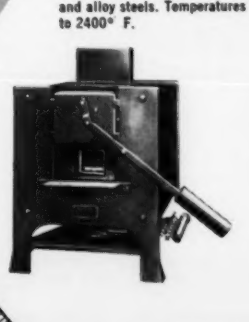
INDUSTRIAL GAS BURNERS & FURNACES

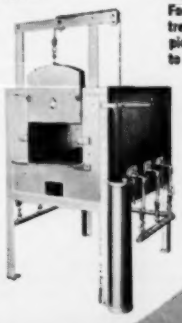
Using Only Low Pressure Gas

for Clean, Fast, Quiet Heat-Up at Lowest Cost!

HIGH SPEED FULL MUFFLE FURNACES
Bench type for heat treating high speed and alloy steels. Temperatures to 2400° F.

LARGE FLOOR TYPE OVEN FURNACES
For universal heat treating of larger pieces. Temperatures to 2000° F.





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Est. 1911

CHARLES A. HONES, INC.

145 So. Grand Avenue, Baldwin, L.I., New York • BAldwin 3-1110

"BUZZER" Burners & Furnaces for Heat Treating, Melting, Soldering

For further information circle No. 37

NEWS TO HEAT TREATERS

Continued from page 29

for applications in any plant where high pressure gas—5 pounds or more—is used. These include the ceramic field, periodic kilns, tunnel kilns, drying applications, foundries, core ovens, ladle heaters, and annealing and heat treating furnaces.

This burner uses atmospheric air to mix with the fuel and may attain a fuel savings of 30% depending upon application. It is 16 in. long by 5 in. in diameter, weighs 15¾ pounds and has a range from 20,000 BTU minimum to 1,500,000 BTU maximum. The only attachment necessary is a gas line.

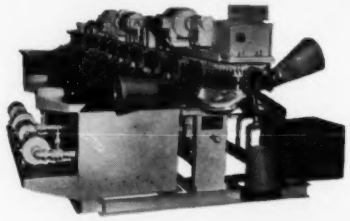
The Bliss burner is a nozzle mixing high pressure burner with pulsation type combustion. The flame produced is instant at full heat and burns with a pulsating action. Bliss burners explode the fuel, which accounts for the efficiency and high temperature found in the units.

For further information circle No. 38

"Little Steve" Machine

A new, compact automatic barrel machine for the precision plating and processing of small parts has been introduced by Frederic B. Stevens, Inc., Detroit, Michigan.

Measuring only 4 ft. high and 6 ft. wide, the new barrel machine is an addition to the "Little Steve" family of junior size automatic plating and processing equipment currently marketed by the firm.



In addition to its small size and automatic load, unload and cycling features, the new Little Steve offers many other advantages to platers and processors of small, intricate parts.

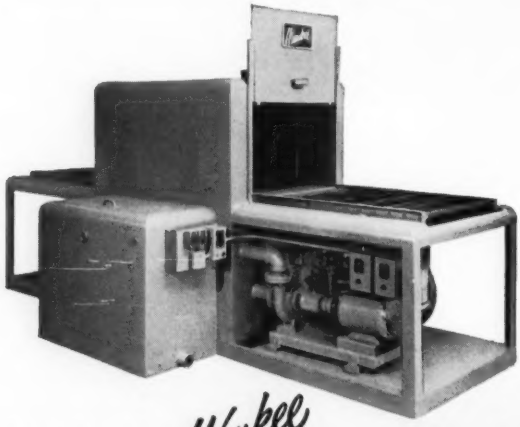
Designed for incorporation into integrated process manufacturing the unit offers outstanding mechanical flexibility and simplicity of control. It can be quickly adapted to meet most processing requirements. An exclusive selective skip track feature permits elimination or addition of any processing step by simple mechanical adjustment. Built-in dryers are also available as optional accessories.

Extremely low ceiling height eliminates the necessity for catwalks and ladders. The complete operating mechanism, as well as the solution tanks and barrels, are easily accessible to the operator at all times from the plant floor level.

For further information circle No. 40

Hamler Hq. Move

Hamler Industries, Inc., will move their headquarters to new office and plant facilities at 400 E. 16th Street, Chicago Heights, Illinois. The move, to be completed by November 1, will include the transfer of all personnel presently employed by the company.



There's a standard Waukee® WASHER
TO MATCH YOUR CARBONITRIDER OR CARBURIZER!

Whatever the size of your carbonitrider or carburizer, the new Waukee Washer has a standard size to match it. Size range: 24 x 36 x 18 — 24 x 48 x 24 — 30 x 48 x 24 — 36 x 48 x 24.

COMPLETE — NO "EXTRAS" — Waukee parts washers come to you complete, ready to locate, connect to utilities, and begin operation. No "extras" to buy and install. Pumps, burners, controls are designed as integral parts of the Waukee Washer. You use your present furnace work-baskets, too.

FLEXIBILITY — You gain in flexibility with Waukee Washers. Standard units are available in "in-and-out" feed or straight-through, conveyor type, and in one, two, or three stages with rinse and dry. High-efficiency with gas, electricity, or steam.

THOROUGH CLEANING — The smallest Waukee Washer sprays a minimum of *one ton of hot detergent solution through the load each minute.* Solution penetrates work basket from top and bottom, washes away oil and foreign matter from the densest charge. Bull's-eye timer cycles the load for complete washing without guesswork or waste of time.

Complete data in Bulletin 1201 — write for it today.

Waukee-washed parts are free of cutting and quenching oils, mean clean furnace atmospheres, therefore predictable case depths and cleaner, brighter work.

Waukee ENGINEERING CO.

5137 N. 35TH ST., MILWAUKEE 9, WIS.

MAKERS OF WAUKEE GAS FLO-METERS • MIXORS • COMPRESSORS

For further information circle No. 39

The new building, occupying 15,000 sq. ft., will be situated on a 12 acre site.

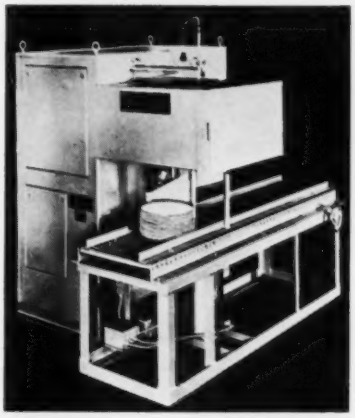
Vance N. Wilson, president and general manager of Hamler, stated that the move is another significant step forward for the company since its reorganization in 1959. Wilson emphasized that the new facilities are custom designed for Hamler's specific operation, enabling the company to handle a larger volume of business more efficiently. Four trucks will operate out of the new plant and, because of better highway facilities, delivery of Hamler's anhydrous ammonia will be expedited within the 250 mile radius served by the new location.

Other Hamler distribution stations in Michigan, Pennsylvania and Ohio, will not be directly affected by the move from the plant's present location in Clearing to the new site in Chicago Heights.

Hamler Industries is the largest distributor of anhydrous ammonia in the midwest.

Aluminum Annealer

A new concept in the annealing of aluminum blanks by induction is gaining rapid acceptance in the metal treating industry. Several of these units have been installed during the past year and a total of five are now in operation. They are a product of Ajax Magnethermic Corp., Youngstown, Ohio.



The unit is a 60 cycle induction heater for annealing of aluminum blanks. The blanks can be of various shapes, principally circular, rectangular or oval. The heater can anneal a range of blanks from 4 in. to 30 in. diameter by use of the appropriate sized coil. Each coil covers a given range of diameters. The unit heats the blanks in 12 in. stacks and thickness of material can range from 1/32 in. up to whatever thickness is required. Heat times range from a minute per stack in the smallest diameter to 40 minutes maximum for the 30 in. diameter.

Operation of the annealer is simple. The operator stacks the blanks on the conveyor, positions them under the heating coil and presses the start button. Automatically the positioning guides retract, the stack is hoisted into the coil and the coil is energized for a pre-timed cycle. When the blanks are up to temperature the coil is de-energized and the stack is automatically returned to the conveyor. The annealed stack is moved to the cooling conveyor while another stack is loaded. The unit shown here can heat 1,000 pounds

Continued on page 41

HEAT

from General Electric

for production heat treating, tool rooms, heat treat departments, laboratories, and pilot operations

NEW Box Furnaces from General Electric offer excellent temperature distribution and operating economy. Modern materials, design concepts and manufacturing methods make these your best furnace buy. The completely new box furnace design is available with either ribbon or silicon carbide resistors. These attractive furnaces can handle numerous heating processes and production jobs: heating for hardening by quenching, forging, annealing, normalizing, firing ceramics, and pack carburizing. Plus, the furnaces can process a wide range of work sizes and shapes. Air atmosphere and most common protective atmospheres also can be employed.

Ask your General Electric Sales Engineer for complete data on G-E Box Furnaces. Write for bulletin GED-4179; General Electric Company, Schenectady 5, N. Y.

735-01

Progress Is Our Most Important Product

GENERAL ELECTRIC

NEW SLANTS ON HEAT PROCESSING FROM SELAS

Individually–or as a package–Selas combustion tools will improve your heat processing!

Wm. Rose & Bros., leading maker of trowels and steel tools, converted from oil to Selas gas-fired heating for hot working and heat treating. Lead bath is brought to heat in half the time of former method; pot life is extended 8-10 times; 20% fuel saving.

Selas combustion components are available individually, or as a complete combustion package, to meet your heat processing needs. The Selas combustion system illustrated above consists of:

- *Duradiant Burners* – generate high intensity radiant heat for controllable fast heating without flame impingement. Duradiant Burners can be utilized in open arrangements . . in-line . . in circular rings . . in spirals . . individually . . in opposed pairs. (Bulletin 54A)
- *Combustion Controller* – by delivering gas-air mixture to burners at preset ratio and pressure, makes possible fast heating and close control. Completely automatic . . no labor required in its operation. Factory Mutual approved. (Bulletin 54B)
- *Flo-Scopes®* – installed at the inlets to the Combustion Controller, measure rates of flow of gas and air and permit accurate determination of gas-air mixture ratios. (Bulletin 54C)
- *Fire Check* – gives complete assurance of safety by automatically extinguishing any flashbacks that may occur. Factory Mutual approved. (Bull. 54D)

Selas also offers other types of burners including Superheat, Refrak, Spear-Flame and Ribbon.

For descriptive literature about any of the above combustion components or information about Selas complete combustion packages, address Mr. P. Berg, General Industry Division.

SELAS CORPORATION OF AMERICA
610 Dreshertown Road, Dresher, Pa.

SELAS

HEAT AND FLUID PROCESSING ENGINEERS
DEVELOPMENT / DESIGN / CONSTRUCTION

DURADIANT and FLO-SCOPE are registered trade names of Selas Corporation of America.

NEWS TO HEAT TREATERS

Continued from page 39

per hour to 850 F. and is rated at 125 KW. Power supply is 440 volt, 1 phase, 60 cycle.

For further information circle No. 43

"Top-Temp" Ovens

A new precision line of laboratory ovens with a heat range up to 1000 F. maximum has been announced by Despatch Oven Company.

The new oven design provides uniform automatic heat control ±½ F., and is adapted for use in teflon fusing or sintering, aluminum treating, glass annealing, and other processing where close temperature control is needed.

Available for either gas or electric operation, the ovens are equipped with indicating-type automatic controls and provide uniform high velocity air flow through the work chamber. Stainless steel blowers are used in conjunction with balanced pre-set louvers to recirculate air and assure even wiping across loads.

Six models, sized from 13 in. by 13 in. by 13 in. to 48 in. by 30 in. by 42 in., are standard. Smaller models are equipped with swing doors; larger units have counterweighted vertical lift doors. All are finished in silicone gray enamel.

The new line is constructed with 6 in. heavy density glass fleece insulation, 20 gauge black iron exterior and 16 gauge aluminized steel interior.

For further information circle No. 44

Conveyor Furnace

A new Type LAC-55M series conveyor furnace has been introduced by C. I. Hayes, Inc., for low cost, highly critical alloying of electronic components, metal bonding and soldering, and similar exacting applications calling for extremely close temperature control through the 300 C. to 1100 C. range.

The LAC-55M furnace is essentially a box type heating chamber with a special custom built loading table at the front end, and a water jacketed cooling section with drive mechanism at the discharge end. Principal design feature is a 3-zone temperature control within the 36 in. heating chamber to obtain correct temperature curves for the particular work being processed. Special muffle construction through preheated atmosphere and temperature baffles insures uniform preheated dry atmosphere.

For further information circle No. 45

Wrought-Cast
All Cast
Unique General Alloys'
WROUGHT-CAST RADIANT TUBES
give consistent long life
General Alloys' combination *Wrought-Cast* Radiant Tube Assemblies give consistent long life because they combine a *cast* return bend with straight tubes made from *rolled and welded plate.*
This design utilizes the erosion resistance of the casting where it is most needed . . . at the return bend. The uniform wall section of the plate forming the straight tube, and its smooth interior surface, prevent "hot spots" and "carbon build-up" that are the prime causes of erratic tube life.
General Alloys Company is unique as a major producer of *both* castings and fabrications and therefore can recommend, without bias, the type of construction best suited for your needs.
For complete data, quotes, or engineering service contact the office nearest you . . . or write General Alloys Company, 390 West First Street, Boston 27, Massachusetts.
All Fabricated
Ask about how our tube repair service can save you money!
GENERAL ALLOYS CO.
the only producer of both heat resisting castings and fabrications
QALLOYS
X-ite

METAL SHOW ANNOUNCEMENT—For the 42nd consecutive year, General Alloys Company will again be a main exhibitor of heat resisting and stainless castings and fabrications. We will be at Booth No. 930 and experienced personnel will be in attendance at all times to discuss your heat or corrosion problems.

For further information circle No. 46

NEWS TO HEAT TREATERS

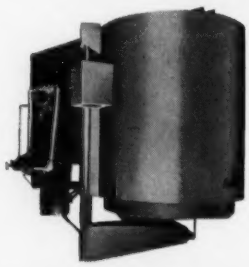
Hevi-Duty's Rotair

A new gas fired or electrically heated heat treating furnace, called the Rotair, was recently announced by Hevi-Duty Electric Company, Milwaukee, Wisconsin.

The Rotair is designed to meet severe operating conditions and provide accuracy in lower range heat treating. A convection furnace, air is heated in a combustion chamber and then circulated through the loaded furnace chamber. Specific applications are in tempering, drying and annealing as well as solution treatment and aging operations. Two temperature ranges are available. One range provides a maximum temperature of 1350 F., while the other has a maximum range of 1700 F.

Hevi-Duty's pit type furnace incorporates several design features to increase product quality and boost production efficiency. Carefully controlled combusion equipment or electric heating units maintain loads at specified treatment temperature. A high speed fan rapidly circulates heated air at a high static pressure to quickly bring the furnace up to operating temperature while assuring even temperature and pressure distribution. Fast, thorough heating is achieved, even in dense loads.

Parts may be suspended, fixtured or placed in baskets for treatment in the Rotair. Top loading allows



easy access with an overhead crane, enables lengthy shafts or heavy parts to be placed, suspended and removed rapidly. Cover operation features pneumatic lift and manual swing out for easy access to the chamber.

For further information circle No. 48

AT THE METAL SHOW **ROLOCK®** BOOTH 1809

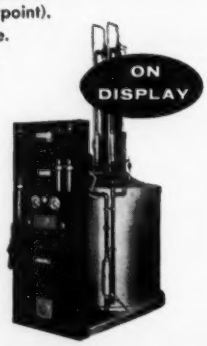
ATMOSPHERE EQUIPMENT

- ***NEWEST and most advanced engineering***
- ***important NEW aids to quality control***
- ***coordinated systems and equipment***

ROLOCK CARBON POTENTIAL CONTROLLER

- Accurately controls carbon potential of furnace atmospheres (not by dewpoint).
- Immediate and constant response.
- Precise and dependable control.
- Minimum maintenance.
- Specially trained operators not required.

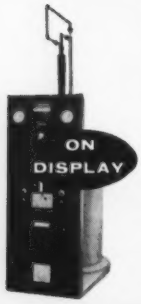
U.S. Patent No. 2,818,246 (Kappel)



ROLOCK ENDOTHERMIC GAS GENERATOR

- Complete reversibility and self-cleaning of catalyst beds.
- Precise gas-air metering and mixing.
- Dual Catalyst chambers . . . complete cracking.
- Triple cooling effect prevents reverse action.
- Compact, easily installed "packaged" unit.

U.S. Patent No. 2,802,725 (Kappel)



ROLOCK AMMONIA DISSOCIATOR

- Same high standards of efficiency and performance as the Endothermic Gas Generator.
- Addition of propane or natural gas adjusts gas levels for heat treating plain carbon or alloy steels.

For technical literature, write:

ROLOCK INC., 1332 KINGS HIGHWAY, FAIRFIELD, CONN.

JOB-ENGINEERED for better work
Easier Operation, Lower Cost

4RL608

For further information circle No. 47

High Temp Refractory

Norton Company has announced the development of a new high temperature refractory product, known as Crystolon "63," which is expected to have wide application as a relatively low cost structural ceramic, high in physical strength but with superior resistance to attack by heat and molten salt. It has already been used experimentally as a lining in aluminum reduction cells. Test results indicate that wall thickness of the cell linings can be reduced about 75%. In addition, substantially less electric power is required to operate the cell.

Crystolon "63" is a silicon nitride bonded refractory. While it was originally developed to meet the need for better refractory linings for aluminum reduction cells, it is suitable for use in such other applications as melting and alloying high purity, expensive metals, transferring molten materials, as a structural ceramic for package boilers, incinerators, and in kiln furniture for the ceramic industry.

For further information circle No. 49

Atmosphere generator tube to resist temperatures of 1800°-2300°F is installed by Lindberg Engineering Company, Chicago. Tube is centrifugally cast from Duraloy "HOM"*, a special high-nickel alloy developed by The Duraloy Company for hot strength in oxidizing atmospheres.

Simple way to "treat" heat-treating equipment to longer tube life at 1200°—2300°F

Specify heat resistant nickel alloy castings for tubes . . . or trays, belt links, fittings . . . for a bonus in extra service

For furnace or generator parts threatened by thermal fatigue, consider the proved heat-resistance of nickel-chromium-iron alloy castings. Available in a variety of types, these alloys offer a wide range of properties for useful strength and long life—in the most demanding environments.

Outstanding performance records. At temperatures above 1200°F, the high-nickel alloys set high standards for resistance to thermal shock, to reducing or oxidizing conditions, to scaling or embrittlement. Suitable high-nickel alloy castings provide the right combinations of properties for tubes or trays; for racks or retorts; for a wide variety of furnace hardware.

How to find the alloy that solves the problem. To help you select the best possible material, we offer a new and data-packed 64-page booklet, "Heat Resistant Castings, Corrosion Resistant Castings . . . Their Engineering Properties and Applications." You'll find it useful when considering such design factors as sizes, shapes, atmospheres, load or cycling requirements, fabricating or assembly methods. Write today for this helpful booklet.

*Registered trademark, The Duraloy Company

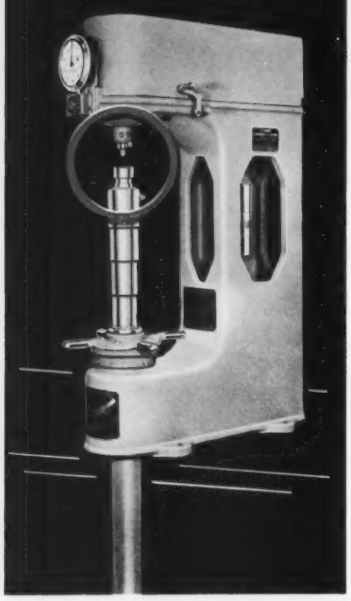
THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

INCO NICKEL

NICKEL MAKES ALLOYS PERFORM BETTER LONGER

For further information circle No. 50

GUARANTEED ACCURATE



The Most for Your "Rockwell Testing" Dollar!

Clark Hardness Testers are *guaranteed* accurate for all "Rockwell Testing". Clark's exacting workmanship in the production of penetrators, testing blocks, anvils, and other accessories pays off in exceptional accuracy on the job. No wonder the low cost surprises our first-time customers. *Clark Instrument, Inc., 10205 Ford Road, Dearborn, Mich.*

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All information about hardness testing in easy-to-read text with many illustrations. Just write "Send Book" on your letterhead. Description and prices for Clark Hardness Tester and free Hardness Conversion Chart also available on request.

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10205 FORD ROAD
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Missile-Age Accuracy

For further information circle No. 51

NEWS TO HEAT TREATERS

How to Judge People

How To Judge People By Their Physical Characteristics is the title of a new human relations service just released. Authored by Emery Kelen, world famous artist whose portrait-caricatures decorate the walls of the Palais des Nations and the League of Nations Museum in Geneva, and many other government buidings and libraries throughout the world, the service is based on some 25,000 portraits of the famous and infamous of all races, creeds and colors.

According to author Kelen, whenever we meet a person we take a good look at him, observing his face and body — the way he talks, gestures, stands and dresses. Consciously or unconsciously we try to figure out what kind of a fellow he is, and what we can expect of him. We measure him by "hunch." But few people are aware that substantial knowledge is available to educate our "hunches." In *How to Judge People,* Emery Kelen — guided by his trained gift as an artist — has sifted and sorted the scattered treasures of the scientists and has brought them together in a comprehensive, easy to understand guide for the layman. His method is especially designed to assist the layman to evaluate correctly everything he can see and hear about a person under normal conditions.

Only well known personalities, both past and present, are used as examples by Kelen. For such personalities have a history—how they acted under certain conditions is a known fact and cannot be argued with. Besides, they make for far more interesting reading.

How To Judge People is issued 24 times a year. It is published by National Business Aids, Inc. of San Carlos and Santa Monica, California and New London, Connecticut. For additional information and samples, write to 1656 Lincoln Blvd., Santa Monica, California.

For further information circle No. 52

Publisher Granted Rights To Soviet Journals

A contract covering the translation into English of 23 major Soviet scientific journals was recently renewed for 1960 and 1961 by representatives of Mezhdunarodnaya Kniga and Consultants Bureau Enterprises, Inc., a New York publishing house.

Aleksandr Belostotsky, an official of Mezhdunarodnaya Kniga (International Book Corp.), which has its headquarters in Moscow, flew from Moscow to formally ratify the renewal of the agreement between the Soviet agency and Consultants Bureau. Earl Coleman, president of Consultants Bureau, which is located at 227 West 17th Street, New York, reported that the agreement guarantees the company exclusive English translation rights for these journals in the fields of chemistry, physics, biology and medicine. The original arrangement was made between the two concerns in 1958 for one year only. At the time this was the first such agreement ever reached between an American publisher and the Soviet Union. The 1958 contract was renewed for one year in 1959.

Under the terms of the new two year agreement, the Soviet agency facilities advance receipt of Russian journals by the publisher here, and is pledged to use all means at its disposal to prevent infringement of the exclusive translation rights by any third party. Original art work and photographs appearing in the Russian periodicals are also rushed to the New York publisher by airmail. In return for these important advantages, Consultants Bureau is making what Coleman described as a "reasonable royalty payment".

In addition, a special clause in the contract requires that Mezhdunarodnaya Kniga keep the publisher informed of any new scientific and technical journals to be published in the USSR. Such exchange of information is expected to greatly improve communications between Soviet and Western scientists, since

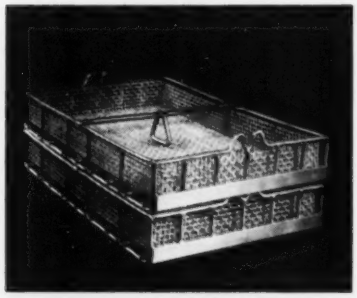
advance knowledge of important publications will make prompter translations possible.

Consultants Bureau pioneered the publication of translated Russian journals in 1949 with the *Journal of General Chemistry*, and is the world's largest producer of such translations — many of which are done under contract for American learned societies. The cooperation which has been established is already making possible the publication of cover-to-cover English translations of many of the journals within six months of their receipt from Moscow.

For further information circle No. 53

New Heat Treat Baskets

Supplementing its line of heat treating equipment, Ipsen Industries, Inc., Rockford, Illinois, has installed facilities to manufacture heat treat baskets. They are designed primarily for use with controlled atmosphere and vacuum units.



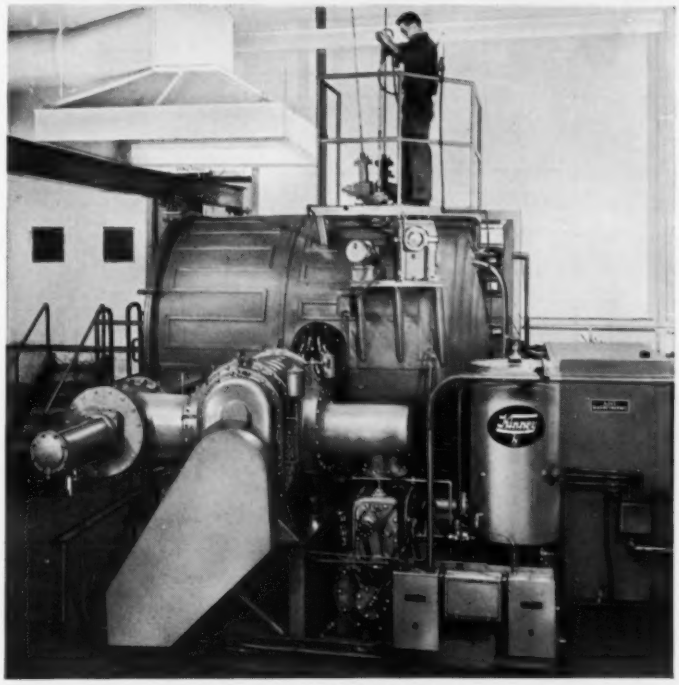
Standard sizes include a 22 in. width, 34 in. length, and 5 in. height; and a 28 in. width, 43 in. length, and 5 in. height. Special sizes are also fabricated. Tray height can range from 2 in. to 9 in. The basket consists of an inconel tray and woven mesh liner. It offers maximum strength at elevated temperatures, and minimum thermal distortion. Openings in the basket permit maximum heating and quenching rates.

These new trays are specially designed for stacking. The ends consist of a double loop and sleeve

Continued on next page

Kinney®

Builds the Vacuum Furnaces to Produce PURE Metals BETTER!



Above, you see a highly versatile KINNEY Vacuum Furnace now in operation at the Watertown Arsenal, Watertown, Mass. In addition to its primary function of Melting and Casting high purity metals, it may be used for degassing atomic materials, sintering carbon molds and alloying reactive metals.

It handles loads up to 1000 lbs. of steel (2200 lbs. uranium) with provision to pour in increments at automatically controlled pouring stations, or pour a full load in 60 seconds. Two interchangeable melting coils, for full capacity and half capacity loads, each provide temperatures up to 3400°F. The pumping system can evacuate the 8' diameter x 11' chamber from atmosphere to 5 microns in 7 minutes and can attain ultimate pressure in the order of .5 micron.

This Furnace is one of a large family of KINNEY designed Furnaces available for Vacuum Melting, Alloying, Refining, Sintering, Heat Treating, Annealing, Welding and Brazing. Details of function, construction and operation may be had by consulting a KINNEY High Vacuum Furnace specialist. Write today!

WRITE FOR FREE BULLETINS TODAY

KINNEY VACUUM DIVISION
THE NEW YORK AIR BRAKE COMPANY
3594K WASHINGTON STREET · BOSTON 30 · MASS.

Please send me full information on KINNEY High Vacuum Equipment indicated.

Furnaces ☐ Pumps ☐ Vacuum Gages ☐

Name_____

Company_____

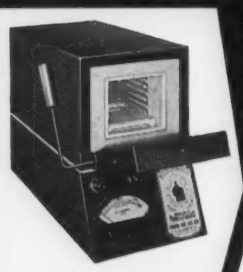
Address_____

City_____ Zone____ State_____

For further information circle No. 54

Designed for Small Parts Treating . . . **HUPPERT** DeLuxe

ELECTRIC FURNACES



• Here's a series of compact, durable furnaces that are ideal for tool and die shops and small laboratories. Any desired temperature within the range of 250° to 2000° F. is controlled by an accurate built-in Huppert Temperature Controller. All-steel construction — multi-insulation — sturdy Kanthal elements — counterweighted doors — removable porcelain tray.

Model No.	Inside Dimensions			Temp. Range	Watts 110 Volts AC	Price
	Wide	High	Deep			
434DL	4¼"	3½"	4¾"	325°—1850° F.	920	$ 90.00
439DL	4¼"	3½"	9"	325°—1850° F.	1650	120.00
436DL	4½"	3¾"	6"	250°—2000° F.	1650	130.00
5DL	4½"	3¾"	9"	250°—2000° F.	1750	176.00
9DL	6"	6"	6"	250°—2000° F.	2200	200.00
669DL	6"	6"	9"	250°—2000° F.	3000	248.00
10DL	8"	4"	6"	250°—2000° F.	2000	220.00
849DL	8"	4"	9"	250°—2000° F.	3000	265.00

Write today for literature on complete line of Huppert Furnaces and Ovens in floor and bench models. Ask for "Hints on Heat Treating."

K. H. HUPPERT CO.
Manufacturers of Electric Furnaces and Ovens
6849 Cottage Grove Ave., Chicago 37, Illinois

Available for 220 Volt AC at small additional cost. Stainless steel housing slightly higher.

For further information circle No. 55

MINIMIZE BURN-OUT...

The PRESSED STEEL CO. PSC

ALL-SHEET CONSTRUCTION LENGTHENS LIFE OF FURNACE TUBES

Experience of users shows much lower frequency of burn-out, with tube life extended up to 100%. In PSC tubes, precision-welded bends are of same metal and thickness as the legs. The continuously smooth walls result in uniform flow of gas, and reduce the carbon build-up and bend burn-out, which commonly result from the rough interiors of cast alloy bends. Lighter than cast by 33 to 50%, PSC radiant tubes cost less initially. Any size, shape or alloy.

Heat-Treat Equipment for Every Use

THE PRESSED STEEL CO.
Wilkes-Barre, Pa.

For further information circle No. 56

NEWS TO HEAT TREATERS

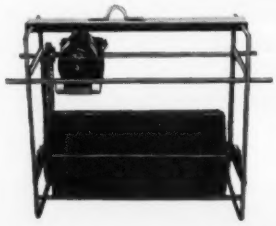
Continued from preceding page

arrangement that locks the baskets and prevents any possibility of slipping. Loaded trays may be stacked and handled as a single unit for heating or quenching operations. Pressure resistant welding offers increased strength at all critical points.

For further information circle No. 57

"Clear-Flow" Tumbling

Clear-Flow Tumbling units for production washing, blackening, pickling, and annealing have been announced by the Bix Company, Wellington, Ohio.



Featuring looped wire cross rod type liners forming slotted openings which assure the user maximum open area, the units guarantee the ultimate in circulation of liquids, allowing faster cycling time with increased loads.

Tumbler support frame of solid round rod construction minimizes liquid transfer and guarantees safety by accessible examination of tumble frame.

For further information circle No. 58

English Producer Orders Wide Plate Quench

Consett Iron Company, Ltd., at Consett in Northern England, has placed an order for a pressure quench for installation in a continuous plate line. This addition will enable Consett to produce fully heat treated wide plate.

The work is under the supervision of the Incandescent Heat Company, Ltd. of Birmingham, licensees of Drever Company, Bethayres, Pennsylvania. The heat treating line line is scheduled to be completed in early 1961.

For further information circle No. 59

Rolock Furnace Fixture

A lift-post fixture assembly for use in pit type furnaces which is designed to save time, speed work, and aid in quality control is being marketed by Rolock, Inc., Fairfield, Connecticut.

Construction of the unit consist of an entirely welded fabrication, using Inconel high heat resistant alloy. The unit consists of a central lift post approximately 5 ft. high with heavy supporting base, so designed that it can expand or contract under drastic temperature changes without buckling. Work carrying baskets are of two sizes; 13 in. high with 1⅝ in. sq. openings holding 64 pieces; the smaller, 7½ in. high with 1⅝ in. sq. openings

holding 20 pieces. Grids are of special Rolock pressure-welded three-layer construction, which is claimed to achieve desired strength with minimum weight. Round-rod grids also show superior resistance to weakening by oxidation. Grids and baskets can be assembled as desired on the lift post.

Engineering design of fixtures such as this focuses on two important considerations. First is the creation of a fixture which will handle a maximum work load with a minimum of effort and waste motion through furnace and quench. The second is to provide necessary support and strength for long furnace hour life with the least bulk of metal in the fixture itself, since fuel and furnace time are equally absorbed in heating the fixture as well as load. The fixture shown is used by a machine tool manufacturer for carburizing hold down plungers and quenching at 1700 F.

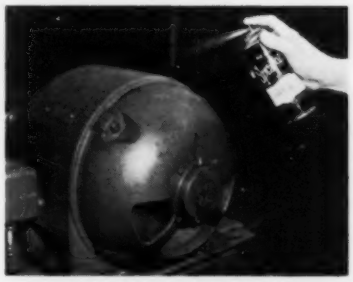
For further information circle No. 60

Push Button Touch-up

Quick and easy touch-up or repainting of electric motors, machinery and other equipment is claimed for Sprayon A. S. A. Machinery Gray Enamels according to the maker, Industrial Supply Division, Sprayon Products, Inc., Cleveland, Ohio. Packer in 16 oz. aerosol cans, the push button enamels are part of Sprayon's line of 47 maintenance and production aids in self-spraying containers.

Both enamels meet American Standards Association specifications. Sprayon No. 325 Dark Gray is equal to ASA #49. Sprayon No. 326 Light Gray is equal to ASA #61.

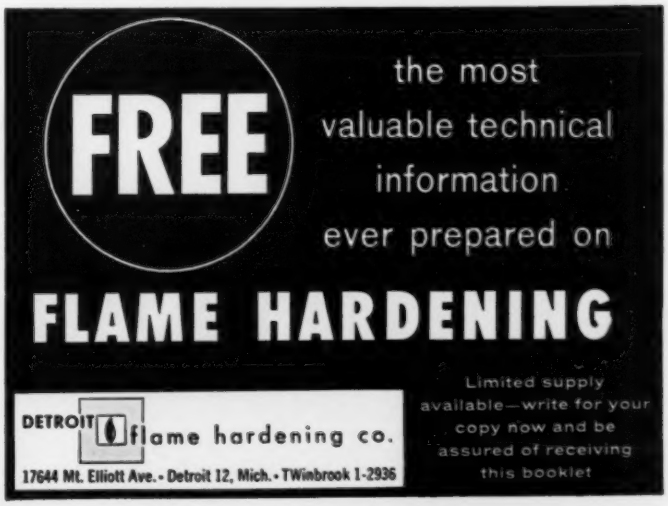
Sprayon self spraying finishes can be used anywhere. No booth



is needed and nothing else is required. Aerosol convenience makes it simple to protect valuable equipment, keep it looking new at all times.

The Sprayon line includes color code enamels, special lubricants, protective coatings and de-greasers. A free handbook of Sprayon *Aerosols for Industry* is also available from the manufacturer.

For further information circle No. 61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the most valuable technical information ever prepared on
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Limited supply available—write for your copy now and be assured of receiving this booklet

For further information circle No. 62

DoALL tells how Lindberg equipment helps produce stainless steel gage blocks

For further information circle No. 63

For the DoALL Company, Des Plaines, Illinois, heat treatment of their Stainless Steel Gage Blocks was a most formidable problem. For lasting accuracy these blocks require extremely hard, wear-resistant surfaces, free from growth or shrinkage, as provided by nitrided stainless steel. Case depth must be controlled accurately and the core maintained at full toughness free of stresses. DoALL found the answer to this problem with a Lindberg Gas Fired Vertical Cyclone Tempering Furnace with a Nitriding Retort.

Norman Silver, Chief Metallurgist, and Lindberg Vertical Tempering Furnace at DoALL Company.

NORMAN SILVER, Chief Metallurgist says, "Our Lindberg equipment supplies the uniformity of heat distribution and the fast accurate control that is needed for the exacting requirements of our product. The furnace responds to control almost instantaneously and maintains the temperature within plus or minus 5°. Its 38" diameter by 36" depth handles 200 to 300 pound loads for the desired production. Results obtained have satisfied us completely with this, the latest of our Lindberg furnaces".

Lindberg provides the most complete line of heat treating furnaces, fuel fired or electric, large or small, for every heat treating requirement. Your Lindberg Field Representative (see your local classified directory) will be glad to consult with you on your heat treating requirements or write us direct. Heat Treating Furnace Division, Lindberg Engineering Company, 2466 West Hubbard Street, Chicago 12, Illinois

Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also, Lindberg plants in Argentina, Australia, England, France, Italy, Japan, South Africa, Spain, Switzerland and West Germany.

LINDBERG
heat for industry

MANUFACTURERS' LITERATURE

For your copy circle the number on the Readers' Service Card

A new fully illustrated bulletin **No. SEC-8,** describes the advantages and design features of the Sunbeam standard gas fired or electric box-type recirculating furnace. This furnace has an operating range of 300 F. to 1400 F. It can be used equally well for drawing, annealing, tempering and stress relieving of both nonferrous and ferrous alloys. Both small and large parts may be compactly loaded and heated under accurate temperature control. The bulletin also contains a chart of maximum input furnace ratings as well as dimensions.

For further information circle No. 64

Baskets and Fixtures for Heat and Corrosion Resistance are featured in Catalog 530 by Alloy Engineering Company, Berea, Ohio. The attractively illustrated booklet offers readers a guide on what to look for in heat and corrosion resisting equipment. Contents range from carburizing fixtures and sintering and brazing to detailed instructions of how to order Alloy products.

For further information circle No. 65

Heat Treat Review, Volume II, No. 2, published by Surface Combustion Division of Midland Ross Corp., contains an interesting four page discussion of the newest developments and present status of high temperature gas carburizing. This article is illustrated with numerous heating curves, test sample photomicrographs and photos of typical high temperature carburizing equipment. Another report gives an account of a modern concealed quench furnace used for commercial heat treating. The power convection design of the furnace permits an unusual variety of job shop work to be heated fast with a maximum of quality control. Parts treated in this unit range from small screws weighing a fraction of an ounce up to 60 pound bull gears.

For further information circle No. 66

Drever Continuous Plate and Bar Heat Treating is the title of a 16 page illustrated booket recently released by Drever Company, Bethayres, Penna. The booklet, one of a series offered by the firm, shows how Drever has met the continuing demand for increased capacity and quality control in these operations. Various Drever installations at some of the leading steel mills in the nation are shown.

For further information circle No. 67

Basics of Induction Heating is a two volume study by Chester A. Tudbury, chief engineer of the New Rochelle Thermatool Corp. The work presents the fundamental principles underlying the induction heating art, as well as the application of induction heating equipment, using the pictured text approach. This style of presentation makes it readily understandable to any reader who is familiar with the basic laws of electricity. The electrical and termal aspects of induction heating, and the mechanical problems associated with fixturing, are thoroughly and lucidly explained. Review questions are given at the end of each section, and a glossary is included in each volume for easy reference. **Basis of Induction Heating** is listed at $3.90 per volue in soft cover and $4.45 per volume in cloth binding.

For further information circle No. 68

An information packed brochure on the Sunbeam Automatic Casemaster Furnace is now available from Sunbeam Equipment Corp., Meadville, Pennsylvania. The bulletin, **No. SEC-9** presents the ratings and dimensions, performance, application, specifications and the many features that accompany this high production unit.

For further information circle No. 69

Catalog Section 30 is the title of a brochure which details the extensive engineering services and fabrication facilities available for Special Process Equipment design and production at Rolock Incorporated, Fairfield, Conn. The engineering approach is stressed and this booklet illustrates and describes not only available facilities, but also a range of typical special fabrications ranging from large and complex weldments in Inconel, the Hastelloys and other special alloys to heavy vacuum and pressure vessels. Rolock equipment, both for produc-

Continued on next page

....tough on retorts

2100° F VACUUM BRAZING

demands Exacting Fabrication

This 8-foot-high bell retort fabricated of ¼-in. RA 330 stainless by Alloy Engineering is used for equalized vacuum brazing in an electric refractory furnace. Designed for 2100° service at a 4 micron/1000 micron equalized vacuum, the retort is subject to cyclic thermal stresses reflected by a 1-in. increase in diameter at operating temperature.

The upper cylinder, 4 feet in diameter, tapers to 6½ feet at the bell base where it is joined to the 1¾-in. mild-steel base ring grooved top and bottom for O-ring vacuum seals.

Alloy's experience with performance factors of high temperature equipment enables it to assist in engineering with recommendations as to construction, type and gauge of material. Careful fabrication, preparation and welding enables Alloy to produce retorts, muffles, and fixtures for trouble-free high-temperature service.

Rely on Alloy's experience and facilities to help solve your heat treating problems.

Write today!

continuous carburizing furnace BASKET

Designed by Alloy or fabricated to your specs.; trays and fixtures for economical service.

2100° hydrogen atmosphere sintering MUFFLE

Custom engineered and fabricated to your service needs.

THE **ALLOY** ENGINEERING COMPANY

70 Sheldon Road / Berea, Ohio

MANUFACTURERS' LITERATURE

Continued from preceding page

tion and comprehensive testing, is described as being capable of handling large units and assemblies. Welding and fabrication personnel are noted as qualified to meet standard, special or specified code requirements.

For further information circle No. 71

Bulletin GED-4124, a four page bulletin lists features and advantages of General Electric high production vertical furnace for continuous bright annealing of stainless steel strip. The illustrated publication describes the furnace's heating and cooling sections and threading device, heating units, coolers and blowers. Typical sizes and ratings and a schematic drawing of a typical bright anneal system are also included.

For further information circle No. 72

GED-4064 is the number of a four page bulletin which describes General Electric's new Ammalene gas producers for bright annealing, bright hardening, furnace brazing and sintering applications. Operating data, ratings and dimensions are given along with a brief discussion of how Ammalene gas is produced. Of particular interest is a schematic diagram which shows a typical Ammalene producer. Cutaway drawing and photos show features of the gas producer, the cooling unit and dust tight electrical enclosure.

For further information circle No. 73

A Special 8 Page Bulletin containing detailed technical data on Chromel-AA, a new modified 80-20 nickel-chromium resistance alloy developed for use as heating elements in controlled atmosphere furnaces, is now available from Hoskins Manufacturing Company, Detroit, Mich. Information presented

Continued on page 52

Bright solution for a bright annealing problem

The non-magnetic stainless steel parts above are used by Waterman Products Company, Philadelphia, Pa., in electron tubes. They are bright annealed at 1150 C (2102 F) maximum temperature in a dry hydrogen atmosphere on a 15 minute cycle. The furnace employs an Inconel muffle, water cooled at the rear for quick cooling of the work.

Since close, uniform temperature control and utmost cleanliness are necessary, electric heat offers obvious advantages. Ordinary ribbon elements, however, have a working limit of about 1150 C (2102 F)—too close to the maximum temperature used for practical operation.

What's the answer? The Waterman Products Company solves the problem by having the parts annealed in a 40 kilowatt electric furnace designed and built by the Drever Company, Bethayres, Pa., equipped with GLOBAR® silicon carbide heating elements.

GLOBAR elements can be used with safety to above 1510 C (2750 F). There are no combustion products to cause problems. There are no stack losses, and radiation loss is reduced to a minimum through the use of insulating refractories. The result is greater efficiency and a cooler shop. GLOBAR elements, moreover, make possible a simpler, more compact furnace, saving space and expense.

The advantages of heating with GLOBAR elements often more than cancel out differentials in Btu costs between electricity and other fuels. Why not investigate with your furnace builder—or write to Refractories Division, Globar Plant, Dept. MP-100, The Carborundum Co., Niagara Falls, N. Y.

For latest advances in silicon carbide heating elements... count on

CARBORUNDUM®

For precise, economical electric heating

GLOBAR silicon carbide heating elements

- Shipped from stock or within two weeks.
- Temperatures from 1400 to 2800 F, precisely controlled, independent of atmosphere.
- Easily replaced from outside without waiting for furnace to cool.
- "On line" operation for many applications—no transformer necessary.
- Elements 4" to 105" in length.
- For greater economy in heat treating, brazing, forging, melting, and sintering.

For further information circle No. 74

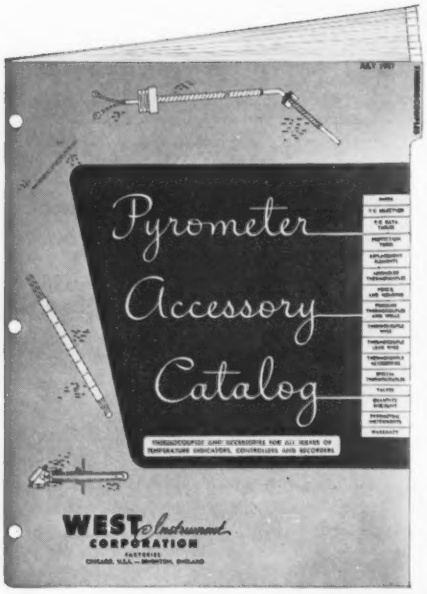
If you use

THERMOCOUPLES

call for

WEST

For *all* applications—for use with all standard types of temperature indicators, controllers, recorders—we make a complete selection of thermocouples from matched and checked wires, assuring constant millivolt output for accurate readings.



NEW DATA BOOK FREE

Revised 40-page file-size catalog

- Lists all data (I.S.A. standards), components and prices
- Graphically shows how to select best thermocouple and protective tube for each operation

Write for your new Thermocouple Data Book now

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the trend is to WEST

For further information circle No. 75

MANUFACTURERS' LITERATURE

Continued from page 50

includes a table of physical properties, typical life and temperature-resistance curves, as well as test data showing the material's resistance to carburization and sulfur corrosion in controlled atmospheres. Also included are complete specification tables listing resistivity and density values of the new material in all standard wire and strip sizes.

For further information circle No. 76

Heat Treating Furnaces is a 12 page bulletin which describes and graphically illustrates the advantages of electrically heated and fuel fired continuous chain belt conveyor furnaces for clean and scale free hardening. Also covers uses for non-decarb hardening, carbon restoration, carburizing, carbonitriding and other heat treatment of bolts, rivets, bearing races and a wide variety of other small and medium size parts. Available from Electric Furnace Company, Salem, Ohio.

For further information circle No. 77

A spectacular 15 minute sound-color 16mm motion picture, **"Vacuum Pouring for Better Forgings,"** has been released for showing by Bethlehem Steel Company on a no-charge basis to scientific and engineering groups, educational institutions, etc. The development of the vacuum pouring process to rid molten steel of entrapped hydrogen stems from the demand for increased quality and high mechanical properties, especially in the field of highly stressed forgings for the atomic energy, electric power, and other specialized industries. Bethlehem has produced this motion picture as a means of sharing its knowledge and experience with others interested in the process and the product. Through live and animated action, each successive step in the vacuum pouring process from

Continued on page 55

Necessary for controlled production in heat treating *Alnor* DEWPOINTER® for Determining Carbon Potential

The atmospheric condition in a heat treating furnace is accurately indicated by the Alnor Dewpointer. A sampling tube from the furnace connected to the Dewpointer makes it possible to check the carbon potential of furnace atmosphere almost instantly at any time during the process.

The Dewpointer can easily be disconnected and moved to other furnaces. The consistency of accurate readings by different operators on different furnaces is evidence of the reliability of the Dewpointer and the ease of operating.

To make a test, a sample taken from the furnace is put under pressure in the observation chamber and then released quickly to atmospheric pressure. If the expansion cools the gas below its dew point a distinctive fog is observed. This is repeated until the fog vanishing point is reached and the end point determined on the pressure ratio gauge. The exact dew point is indicated immediately. The model 7000-U Dewpointer is priced at $410.00.

Alnor INSTRUMENTS

Write for bulletin 2051

ALNOR INSTRUMENT CO.

Division of **Illinois Testing Laboratories, Inc.**

Room 556, 420 N. LaSalle St., Chicago 10, Ill., U.S.A.

For further information circle No. 78

LepeL

HIGH FREQUENCY INDUCTION HEATING UNITS

HARDENING · ANNEALING
ZONE REFINING · BRAZING
FORGING
SOLDERING · BRAZING

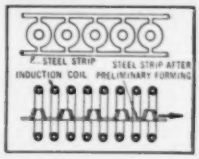
Lepel induction heating equipment represents the most advanced thought in the field of electronics... the most practical and efficient source of heat developed for numerous industrial applications. You are invited to send samples of work with specifications. Our engineers will process and return the completed job with full data and recommendations without cost or obligations.

TYPICAL INDUCTION HEATING APPLICATIONS

PLASTIC COATING OF TOOL HANDLES

A production line operation for coating handles of tools at Whitney Metal Tool Co., Rockford, Ill. uses induction heating with excellent results. The handles only are heated by induction to the desired temperature then dipped into a vinyl chloride base coating material for a short period depending upon the thickness of coating desired. The plastic coating formed on the handles is then cured by immersion in a carbo-wax bath.

FORMING OF METAL STRIP FACILITATED BY PROGRESSIVE ANNEALING



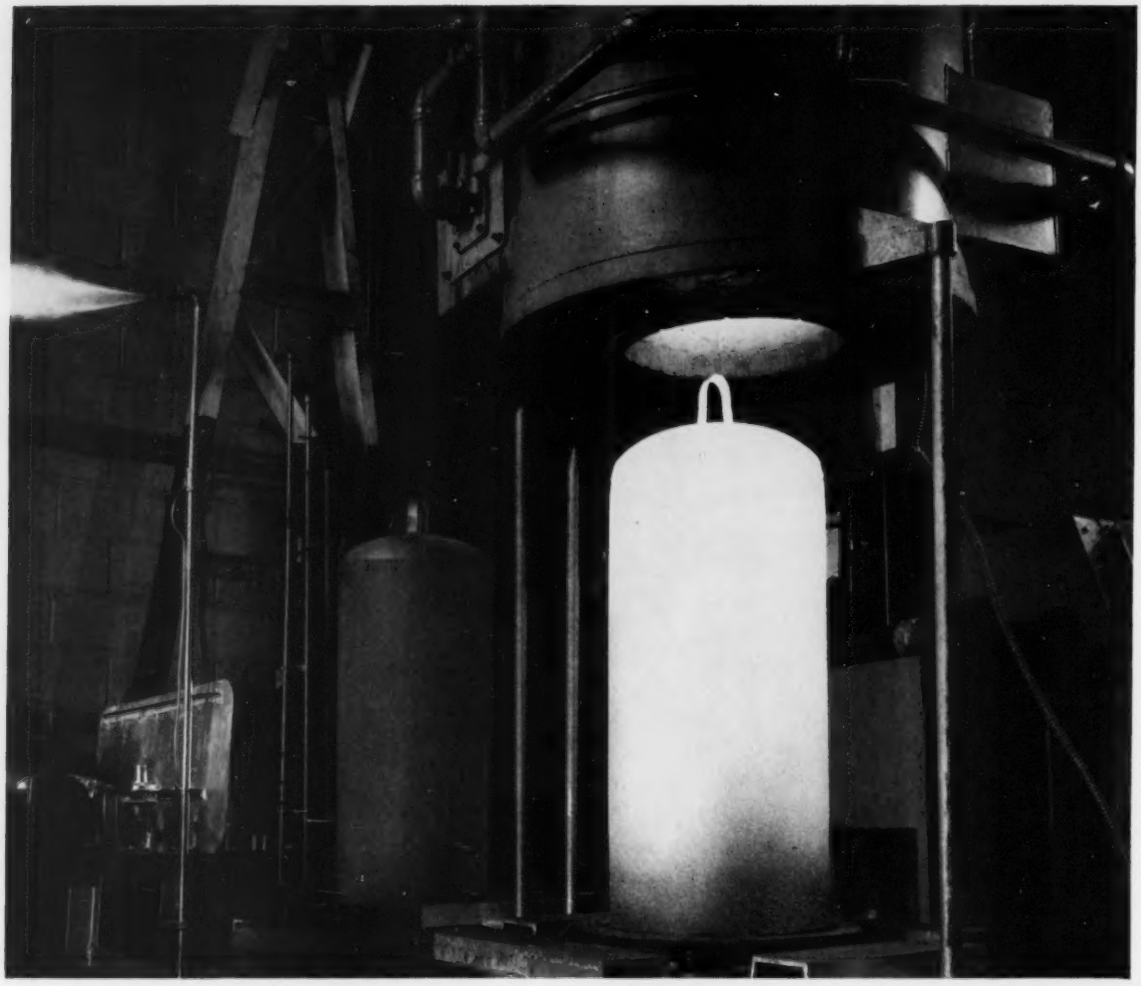
Metal forming operations which require intermediate anneals to restore ductility can be facilitated by induction annealing the strip progressively. Diagram illustrates this procedure for partially formed thin austenitic stainless steel strip. The induction annealing operation is scheduled in the production line between two press operations. Metal strip and wire of other materials are also induction annealed in this manner.

WRITE FOR NEW LEPEL CATALOG
Electronic Tube Generators from 1 Kw to 100 Kw.
Spark Gap Converters from 2 Kw to 30 Kw.

LepeL HIGH FREQUENCY LABORATORIES, INC.

55th ST. & 37th AVE., WOODSIDE 77, N. Y.

For further information circle No. 79



This glowing Inconel retort goes through as many as 8 cycles a day at Metallurgical Consultants, Inc., . . . and is still in good condition after a year's continuous use.

See for yourself how Inconel alloy faces up to 8 loads a day—and heat as high as 2250°

The men who use this bell type retort day after day have given it a pet name "The Work Horse."

And an apt name it is! For the Work Horse does many different kinds of jobs. For instance, it is used for copper brazing, nickel brazing and sintering, as well as high temperature annealing.

The retort, and the furnace, were designed and built by Metallurgical Consultants, Inc., Maywood, California, for their own use. Since controlled atmospheres at temperatures up to 2250°F were expected, they fabricated the retort from Inconel* nickel-chromium alloy.

Inconel alloy has excellent high-temperature strength and resistance to attack by the common heat-treating atmospheres. It also resists thermal shock when forced cooling is needed. And besides, the alloy is readily fabricated and welded.

This particular Inconel retort has been in service for over a year and is still in good condition.

Want to see for yourself some of the many ways Inconel alloy improves service life of high temperature equipment? Some of the many types of equipment that have been developed with it? You'll find all this—and more—in our 20-page illustrated booklet, "Keep Operating Costs Down...*When Temperatures Go Up.*" Write for a copy.

*Inco trademark

HUNTINGTON ALLOY PRODUCTS DIVISION
The International Nickel Company, Inc.
Huntington 17, West Virginia

INCONEL®

For further information circle No. 80

MANUFACTURERS' LITERATURE

Continued from page 52

preparation of the equipment to the pouring of a multiple-heat ingot is described. A high-speed television camera peers into the vacuum chamber to show the molten stream of metal exploding into countless tiny droplets in order to release the trapped hydrogen gas into the vacuum.

For further information circle No. 81

A New Products Selector Brochure has been issued by Macco Products Company, Chicago. The handy pocket-size booklet tells how to select cleaners, cutting lubricants, drawing compounds, rust preventives, forging compounds, and extrusion lubricants. Also lists 46 different compounds in the above categories to simplify selection by pin pointing to specific applications. This selector includes compounds for all types of metal and processing conditions.

For further information circle No. 82

A four page bulletin describing and illustrating **Radiant Plate Directed Heat Elements** is available from Pacific Scientific Company. The booklet discusses the many advantages obtained in using radiant plate elements in high temperature furnace design and construction.

For further information circle No. 83

A 12-page catalog, **Bulletin 71-TH-1960,** describing a complete line of industrial high temperature, recirculating, gravity and forced convection ovens, is now available from Trent, Inc., Philadelphia, Pa. In addition to the standard Basic Ovens, the catalog covers a variety of special designs for such electrical heating applications as die heating, rubber curing, baking chemicals, glass annealing, aluminum treating,

Continued on page 56

The first

BRIGHTNESS PYROMETER

which is fully

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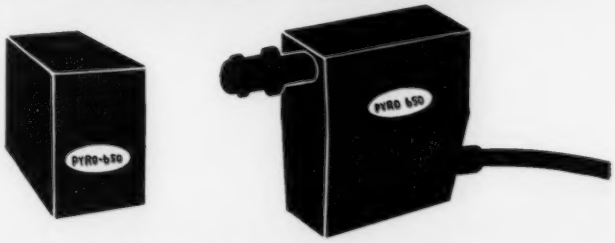

for temperature measurement, recording and control in the ranges from 1100°F to 7200°F and 600°C to 4000°C.

Brightness pyrometers are widely used for non-contacting, high temperature measurements. However, because existing devices are manually operated, their use has been limited to intermittent temperature measurements of short duration.

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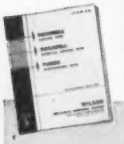

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MANUFACTURERS' LITERATURE

Continued from page 55

and others. The catalog also includes a discussion of the advantages of folded-and-formed ribbon-type resistance heating elements, which allow extremely accurate process control over a wide temperature range.

For further information circle No. 86

Technical Developments in the area of instrumentation are but one of several types of articles featured in the third issue of the new Beckman Scientific and Process Instruments Division quarterly magazine, *The Analyzer*. The 16 page book also covers case histories of actual applications involving Beckman products. In addition to the usual information contained in such a magazine, Beckman offers readers the opportunity of establishing contacts and background information on tools and instruments used in any of the processes described.

For further information circle No. 87

A Unique 15 Year Economic Forecast which probes the United States economy to 1975 is available from American-Marietta Company. A-M has just completed a year long independent study to project our nation's economic outlook, particularly as it is related to expanding markets, research and development, and the growth opportunities ahead for industry. This booklet summarizes the conclusions of that study. Projections are based on the best available figures from government and industry. Unlike most studies, which reach only a few years in the future, this book is unusual in that its findings anticipate the nation's economic growth for the next 15 years. A complete set of charts showing anticipated expenditures in a number of fields accompanies the report.

"The Years Ahead — 1960-75" is also a stimulating and useful account of American-Marietta's projections for the years ahead.

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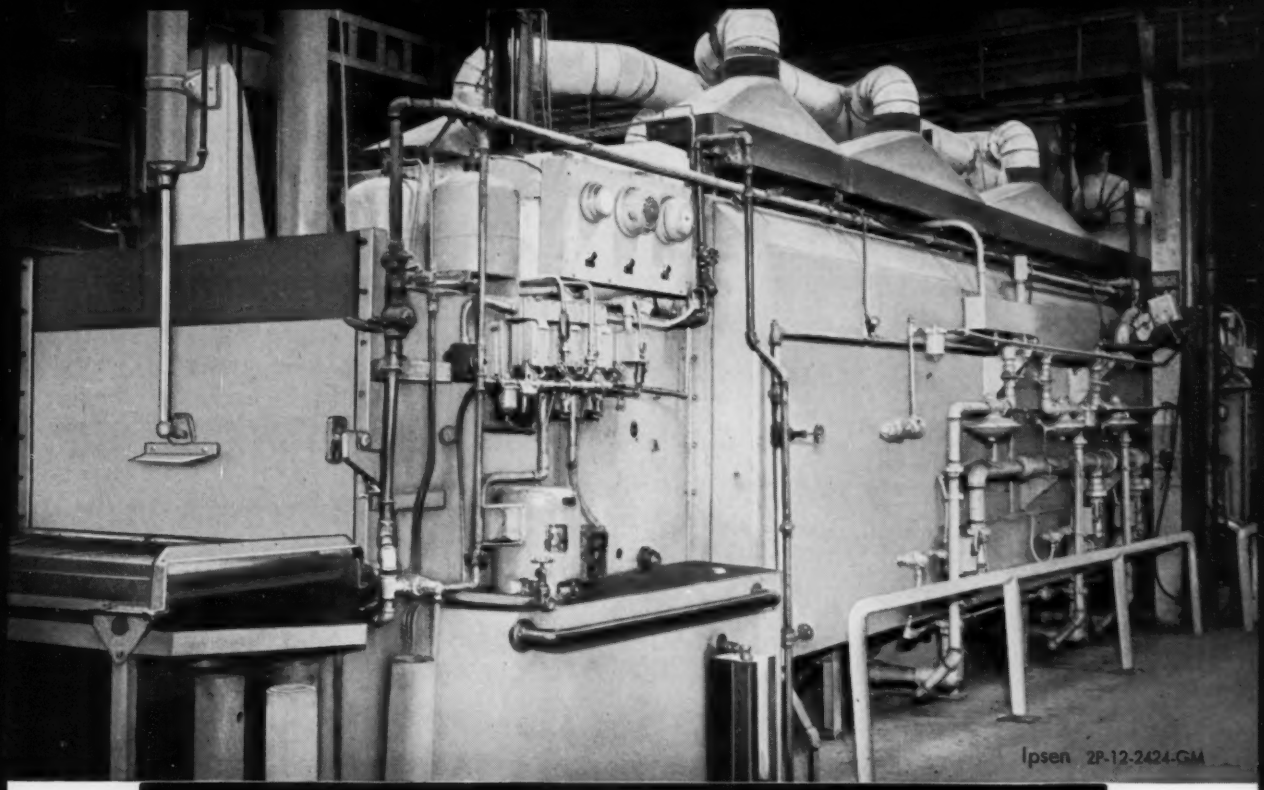

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- Quench Oil Flow System (Pat. No. 2,854,013)

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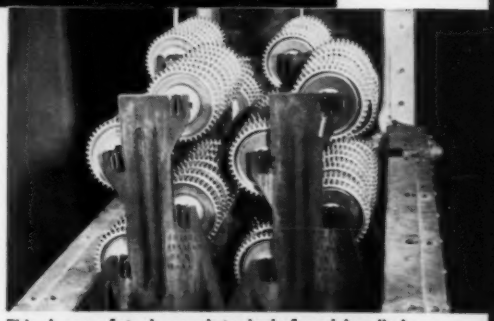
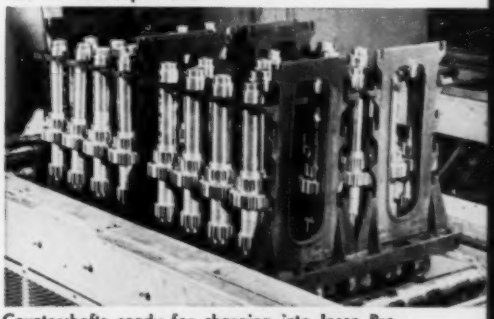
Ipsen Pusher furnaces are described in Bulletin P-59. Send for your copy today.



This charge of steel gears is typical of work handled in Ipsen Production Carburizing Furnaces. Heating was 1700° F for 10 hours. Quenching was in oil at 150° F. Case depth: .045".



Countershafts ready for charging into Ipsen Production Carburizing Furnace. Heating time was 10 hours at 1700° F; quenching was in oil at 150° F. Case depth: .045".

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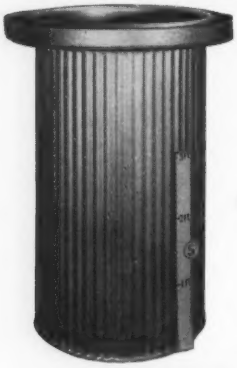

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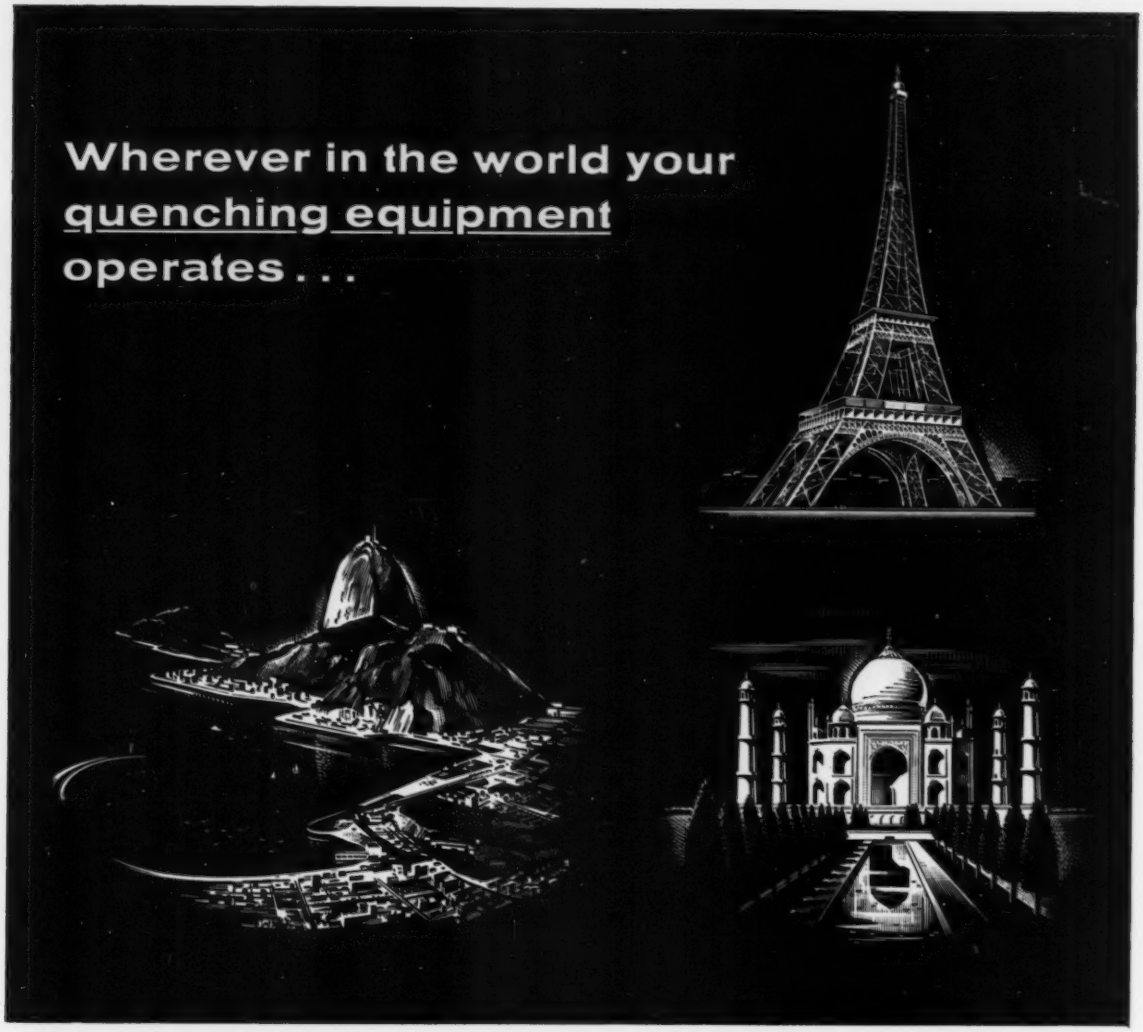

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